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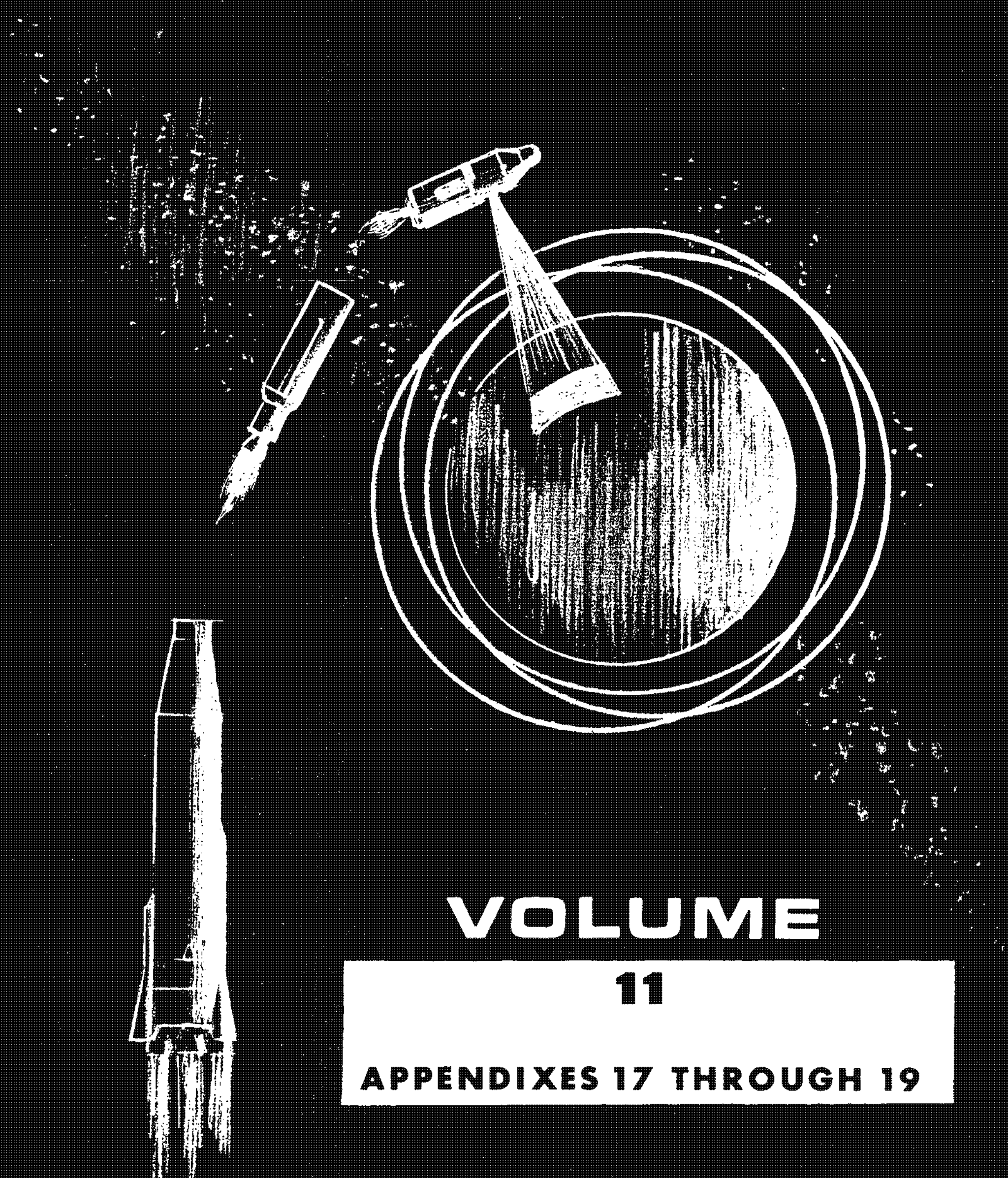
PROGRAM REPORT



VOLUME 11

APPENDIXES 17 THROUGH 19

THIS DOCUMENT CONTAINS 210 PAGES
NOVEMBER 1967

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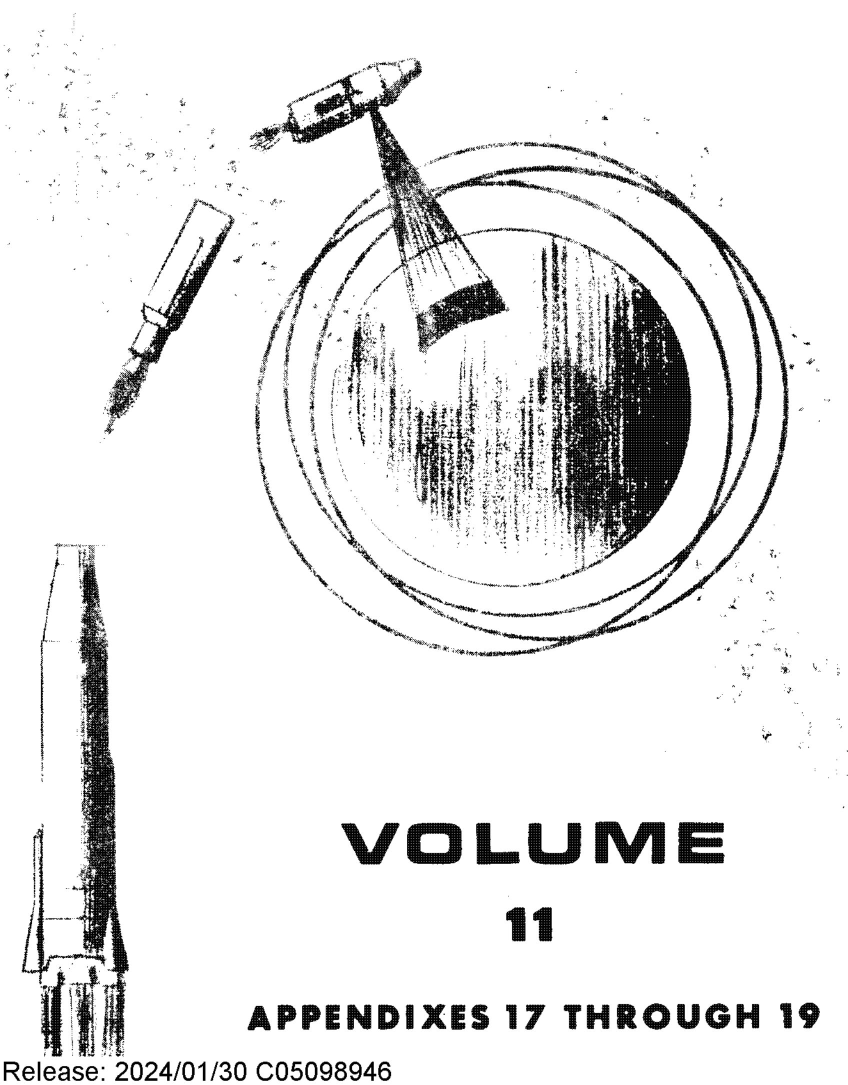
PROGRAM REPORT



VOLUME
11

APPENDIXES 17 THROUGH 19

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APPENDIX 17

SATELLITE VEHICLE MODEL SPECIFICATION

DIN: SVS 5364

SVS 5364
8 February 1967

This Document contains 119 pages.

SATELLITE VEHICLE

MODEL SPECIFICATION (U)

Prepared by: A. Seraydarian Date 2/15/67
A. Seraydarian, Flt. System Specialist

Approved by: P. Connaught Date: 2-15-67
P. Connaught, System Engineer

Approved by: T. D. McLay Date: 2-22-67
T. D. McLay, System Development Engineer

Approved by: R. J. Jensen Date: 2-15-67
R. J. Jensen, Manager
Configuration Management

Approved by: L. A. Binegar Date: 2-24-67
L. A. Binegar, Manager, 206 Program

Issued by: C. J. Broomall Date: 2-24-67
Specification Control

GENERAL ELECTRIC
MISSILE AND SPACE DIVISION
MILITARY SPACE PROGRAMS
KING OF PRUSSIA PARK
P.O. BOX 8661, PHILADELPHIA 1, PA.

SVS 5364

LIST OF EFFECTIVE PAGES

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SECTION 1

SCOPE AND MISSION

1.1 SCOPE

This specification covers models of equipment identified as follows:

USAF Designation:	206 Satellite Vehicle
Manufacturers Name:	General Electric Company Missile and Space Division Spacecraft Department
Manufacturers Model	SV 988 and Subsequent
Designation:	Contract AF04(695)-580

1.2 MISSION

The Satellite Vehicle, when placed in an earth orbit, shall be controlled by the Air Force tracking network. A portion of the vehicle shall be capable of re-entering the earth's atmosphere for recovery.

SECTION 2

APPLICABLE DOCUMENTS

2.1 GOVERNMENT

2.1.1 MANDATORY COMPLIANCE

Compliance with the following documents is mandatory except as limited below:

Document	Date	Title
[redacted] Exhibit 61-10	18 Feb 63	Air Force, General System
Addendum No. 1	6 Aug 63	Engineering/Technical
Addendum No. 2	6 Dec 63	Direction and Associate Contractor Responsibilities for Program 206
[redacted] Exhibit 62-3	10 Apr 63	Acceptance Procedure for Program 206 Satellite Vehicle Hardware
MIL-R-27542A	2 May 63	Reliability Program for Systems, Subsystems and Equipment

Deviations:

a. This specification does not apply for SRV and BUSS components that have demonstrated acceptable flight performance.

b. Vendor/subcontractor compliance not required except as authorized by changes issued under Changes Clause to the contract.

c. Contractor shall not perform testing solely for the purpose of reliability determination.

d. The reliability demonstration, mathematical model, and study requirements as specified elsewhere in this work specification apply.

e. Reliability documentation will be limited to that required by paragraph 1.4 (DD Form 1423) and paragraph 3.1.3 of the AF 04(695)-580 Work Specification, [redacted] Exhibit 64-5.

Document	Date	Title
MIL-I-26600	2 Jun 58	Interference Control
Amendment 2	9 May 60	Requirements, Aeronautical Equipment

Deviations:

a. Figures 7 and 9, revise as follows:

   1. Figure 7: Change limit from "30 db above 1 microvolt" to "60 db above 1 microvolt per meter".

   2. Figure 9: Change limit from "15 db above 1 microvolt per megacycle" to "80 db above 1 microvolt per meter per megacycle".

b. The SRV and the BUSS need not comply with MIL-I-26600 and SVS 4364 except when components are used which have not been previously used in flight tests or when components have been electrically modified; such items must revert to procedures of MIL-I-26600 and SVS 4364 and therein show compliance.

c. The complete satellite vehicle shall comply with MIL-E-6051C. Compliance for complete EMI to MIL-E-6051C shall be demonstrated by successful MAB, Pad and Flight operations.

d. AGE end items other than items 88, 89, 110, 112 and 118 need not comply. The items which shall comply are further identified as follows:

Item 88	Sigme
Item 89	Command Signal Generator
Item 110	SV Launch Control Console
Item 112	LSB Power and Distribution Equipment
Item 118	LOB Signal Distribution Unit

MIL-E-6051C	17 Jun 60	Electrical - Electronic System Compatibility and Interference Control Requirements for Aeronautical Weapon Systems, Associated Subsystems, and Aircraft
MIL-E-8189B	15 Jul 58	Electronic Equipment, Guided
Amendment 1	22 Oct 58	Missiles, General Spec For
MIL-D-70327	16 Mar 59	Drawings, Engineering and
Amendment 2	27 Mar 62	Associated Lists

MIL-S-6644A	22 Sep 55	Specifications, Equipment, Contractor Prepared, Instructions for Preparation of
MIL-W-9411A (USAF)	19 Jun 59	Weapon Systems: Aeronautical,
Amendment 2	5 Apr 60	General Specifications for
MIL-STD-803 (USAF)	5 Nov 59	Human Engineering Criteria for Aircraft Missiles, and Space Systems, Ground Support Equipment
SSD Exhibit 62-14	1 Feb 62	AGE, Spare Parts, Interconnecting Kits & Maintenance Support for R&D Programs
T.O. 00-25-223	1 Feb 62	Integrated Pressure Systems and Components
DCAS Exhibit 62-105	1 Jun 62	Contractor Reporting Procedures for Missile Propellants Div.

Deviation:

Delete paragraph 4d, "Monthly Inventory Transaction Report".

AFBM Exhibit 58-1	1 Oct 59	Contractor Reports Exhibit
Revision 1	15 Mar 61	

Deviation:

Change reference of AFBM Exhibit 58-10 to MIL-R-27542A which supersedes AFBM Exhibit 58-10.

WDTC Exhibit 57-36	15 Apr 57	Specification and Development and Test Program Plan; Operational Ground Support Equipment System, Requirements for the Preparation of
MIL-Q-9858A	16 Dec 63	Quality Program Requirements
USAF Bulletin NR515	3 Nov 59	Control of Nonconforming Supplies

2.1.2 LIMITED COMPLIANCE

The following documents, with issue dates as listed below, form a part of this specification to the extent specified herein:

Document	Date	Title
MIL-P-116D	29 Sep 60	Preservation, Methods of
MIL-P-26536A	31 July 59	Propellant, Hydrazine
MIL-P-26539A	14 Jun 62	Propellant, Nitrogen Tetroxide
MIL-P-27401B	19 Sep 62	Propellant, Pressurizing Agent, Nitrogen
MIL-P-27404	3 Apr 62	Propellant, Monomethyl Hydrazine
ARDC	1962	Model Atmosphere

2.1.3 GUIDANCE DOCUMENTS

The following documents shall be used for guidance only; compliance is not a contract requirement:

Document	Date	Title
AFSCM 375-1	1 Jun 62	Configuration Management During the Acquisition Phase
MIL-A-8421B	5 May 60	Air Transportability Requirements General Specification for
MIL-E-5272C	13 Apr 59	Environmental Testing, Aeronautical and
Amendment 1	20 Jan 60	Associated Equipment, General Specification for
MIL-STD-129C	11 July 60	Military Standard Marking for
Change Notice 1	10 Feb 61	Shipment and Storage
Change Notice 2	25 May 62	
Change Notice 3	28 Aug 62	

USAF Specification Bulletin 506	11 May 59	Reliability Monitoring Program for Use in the Design, Development, and Production of Air Weapon Systems and Support Systems
MIL-M-26512C	13 Dec 63	Maintainability Requirements for Aerospace Systems and Equipment
SSDM 80-1	6 Apr 62	Flight Test Documentation Manual
AF/SSD Exhibit 61-47	10 Aug 61	Computer Milestone Definitions
ANA Bulletin 445	12 Jul 63	Engineering Changes to Weapon Systems Equipments and Facilities

2.2 GENERAL ELECTRIC COMPANY - SPACECRAFT DEPARTMENT

2.2.1 MANDATORY COMPLIANCE

Compliance with the following General Electric Spacecraft Department (GE-SD) documents is mandatory:

Document	Date	Title
SVS 5388	3 Jan 67	System Acceptance Specification
SVS 5013	10 Jun 63	PALC II/SV Interface Specification
SVS 5013-1	24 Jul 64	
SVS 5013-2	25 Feb 65	
SVS 4382	16 Apr 63	Booster/SV Interface Specification
SVS 4382-1	20 Dec 63	
SVS 4382-2	31 Jan 64	
SVS 4201, Rev. C	2 Aug 63	Interface Specification, Tracking Station

SVS 4379	18 Dec 62	External/Internal Environmental Design Criteria
AN 4379-1	3 Dec 63	
AN 4397-2	10 April 64	
SVS 4364	19 Sep 62	Deviations and Additions to Military Specification MIL-I-26600 as Applicable to Program 698AL

2.2.2 The following documents form a part of this specification:

Document	Date	Title
SVS 4490A	15 Sep 64	Environmental Control Subsystem
SVS 4475B	5 May 65	Subsystem Design Specification, Separation Subsystem
SVS 3969F	14 Oct 65	Subsystem Design Requirements, TT&C
SVS 4400C	10 Aug 65	TT&C Subsystem Requirements for Installation of Backup Stabilization System
SVS 5283A	10 Aug 65	Program A83-A SRV Subsystem Design Requirements
SVS 5005-1	22 Dec 64	Specification for Stabilization Subsystem, BUSS
SVS 5357	14 Oct 66	Stabilization Subsystem Specification
SVS 3995E	10 Aug 65	Liquid Bipropellant System for Orbital Adjustment of a Space Vehicle
SVS 5177	11 Jun 64	Structures Subsystem
SVS 5288	30 Apr 65	Power Subsystem Design Requirements
SVS 5289A	10 Aug 65	Harness Subsystem

SVS 5312	19 Aug 65	Input Output Format Spec.
SVS 3954C	21 Nov 63	Operational AGE Systems Specifications
SVS 5016B	11 Dec 63	Test Comm. Definition Specification
SVS 5329	28 Jun 66	Command Definition Specification
SVS 5318	27 Jun 66	Operational Software Hdwr Con & Lim

2.2.3 LIMITED COMPLIANCE AND GUIDANCE

The following GE-SD documents of the latest revision form a part of this specification to the extent specified within this specification:

Document	Date	Title
SVS 4200	6 May 64	Rocket Fuel Requirements for Space Engines
SVS 4364	19 Sep 62	Deviations and Additions to MIL-I-26600 as Applicable to Program 698
118A1526K	29 Jan 65	Identification Marking
238R847H	30 Jan 65	Vehicle External Marking
825D609G1-H	15 Mar 65	Receptacle, Electrical Umbilical
SVS 3953D	4 Apr 66	Component Qualification & Acceptance Requirements
102B7822E1-3	15 Feb 65	Plug, Quick Disconnect
62SD4562	2 Nov 62	Program 206 Interference Control Plan

2.3 OTHER DOCUMENTS

2.3.1 AEROSPACE CORPORATION DOCUMENTS

Compliance with the following documents is mandatory:

Document	Date	Title
AS-63-0000-00630	12 Feb 63	Program 206 System Requirements
Addendum No. 1	5 Aug 63	Specification, Revision I
Addendum No. 2	6 Dec 63	
Addendum No. 3	21 Apr 64	
Addendum No. 4	27 May 64	
Addendum No. 5	8 Jul 64	
Addendum No. 6	9 Nov 64	
Addendum No. 7	26 Aug 65	
Addendum No. 8	26 Aug 65	
AS-62-0000-07117	10 Aug 62	General Specification for Environmental Requirements for SV Equipment Components of the SV Program

Deviation:

Paragraph 3.2.1.4 is not a requirement for the Barnes horizon scanner.

2.3.2 LOCKHEED MISSILE AND SPACE CORPORATION

The following documents, with issue dates as shown, form a part of this specification to the extent specified herein:

Document	Date	Title
LMSC 1521313-505		BUSS Breadboard
LMSC 1414246	26 Aug 63	BUSS Acceptance Test Specification

2.3.3 BARNES ENGINEERING CORP.

The following document, with issue date as shown, forms a part of this specification to the extent specified herein:

Document	Date	Title
Barnes 2027-S-01	9 Jul 65	System Performance Requirements

2.4 PRECEDENCE

The precedence of documents applicable to the Program 206 Satellite Vehicle shall be as follows:

a. The Contract and the Work Statement.

b. This specification.

c. Documents listed in Section 2.2 of this specification.

SECTION 3

REQUIREMENTS

NOTE: Paragraphs 3.1 and 3.2 are for reference purposes only.

3.1 MISSION REQUIREMENTS

The Program 206 Satellite Vehicle mission will accomplish the following:

a. Capability of SV to survive vibration, heating, and loads produced during powered flight and injection.

b. Earth reference acquisition by the Stabilization Subsystem.

c. Tracking, Telemetry, and Command transmission to, and reception from, the tracking network to enable vehicle control and performance interpretation.

d. Orbit correction capability to effect in-plane adjustments.

e. Capability to control the thermal environment of the spacecraft interior.

f. Capability to maneuver the spacecraft as required.

g. On command, capability to assume the proper orientation for re-entry.

h. De-orbit of the re-entry vehicle by either primary or backup mode so that impact will occur in a preselected area.

i. Aerodynamic stability of the Satellite Recovery Vehicle during re-entry.

j. Capability for recovery during descent or after water impact.

k. De-orbit of those remaining portions of the SV such that impact will occur in predicted deep ocean areas.

l. A special fly-low capability in addition to design orbital capability.

3.2 SATELLITE VEHICLE SYSTEM

3.2.1 SYSTEM DESCRIPTION

The total flight system comprises an SLV-3 (Atlas), an SS-01-B (Agena), and the orbiting Satellite Vehicle (SV). Standard nomenclature by which these sections, or combinations thereof, are to be referred is as listed below and as shown in Figure 3-1.

The Satellite Vehicle is the flight system consisting of the Orbital Control Vehicle (OCV), Adapter, Satellite Recovery Vehicle (SRV), and Government-Furnished Equipment (GFE).

a. OCV: The OCV is that portion of the SV that houses battery power supplies, telemetry, command, and attitude control components. The OCV establishes structural continuity between the SS-01-B and the remainder of the SV system. (For a view of the inboard profile of the OCV and other vehicle sections, See Figure 3-2.)

b. Adapter: The Adapter establishes structural continuity between the OCV and the SRV and houses Telemetry, Tracking, and Command Subsystem components.

c. SRV: The SRV is that portion of the SV which houses the recoverable capsule, SRV deorbit propulsion components, and retrieval subsystem. The SRV supporting structure protects the internal components during descent from orbit through re-entry into the earth's atmosphere.

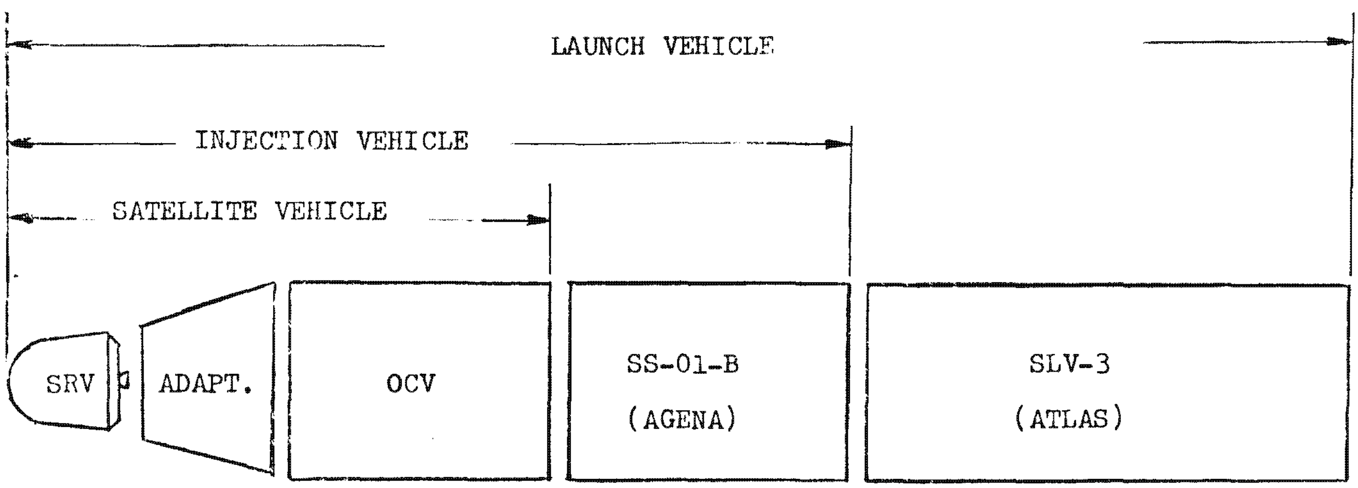

Figure 3-1. Nomenclature Derivation

The SLV-3 provides initial boost. During the Atlas sustainer and vernier stage, the SV is guided with the GE Mod II radio guidance link. After Atlas vernier cutoff, the Agena/SV separates from the Atlas. The Agena/SV then coasts to a designated altitude. During the coast, the Agena control system orients the vehicle into the proper attitude for orbit injection. The Agena primary propulsion system is then ignited and commanded to shut down when the appropriate velocity has been attained.

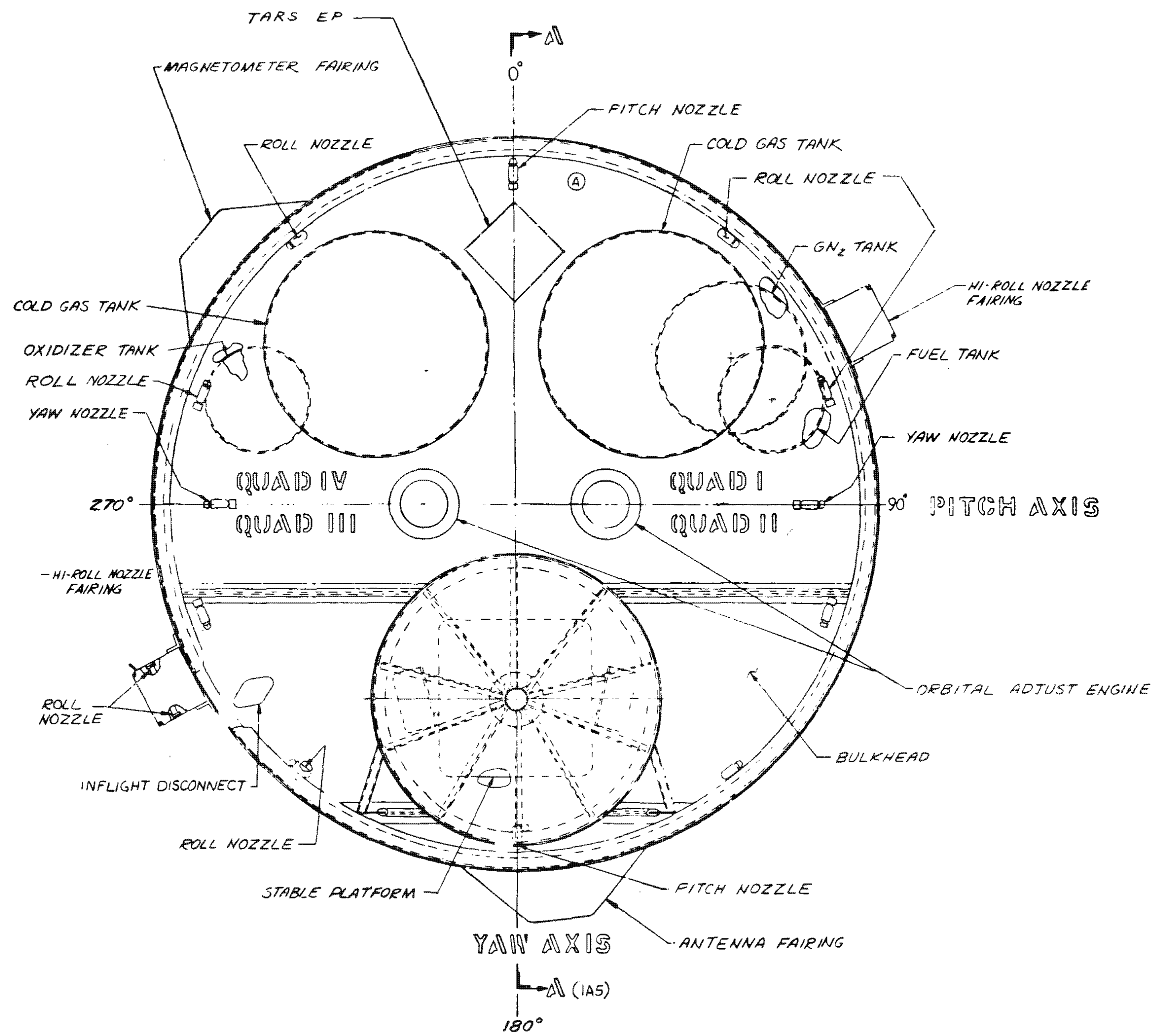

FIGURE 3-2. INBOARD PROFILE (SHEET 1 OF 5)

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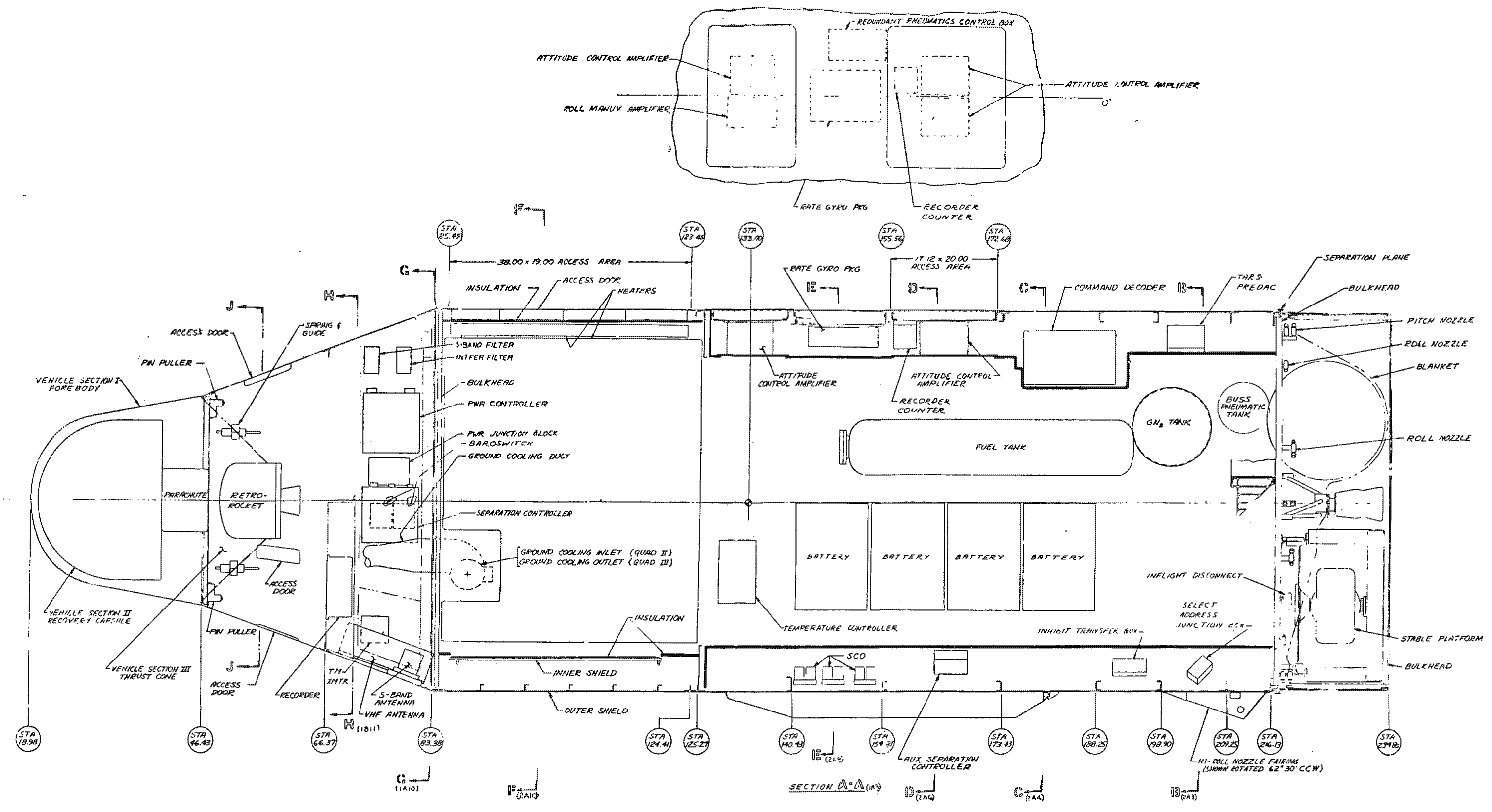
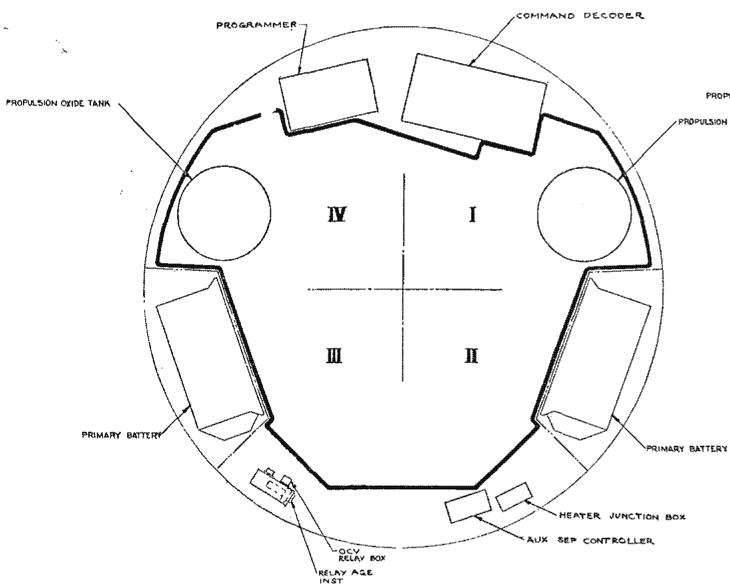
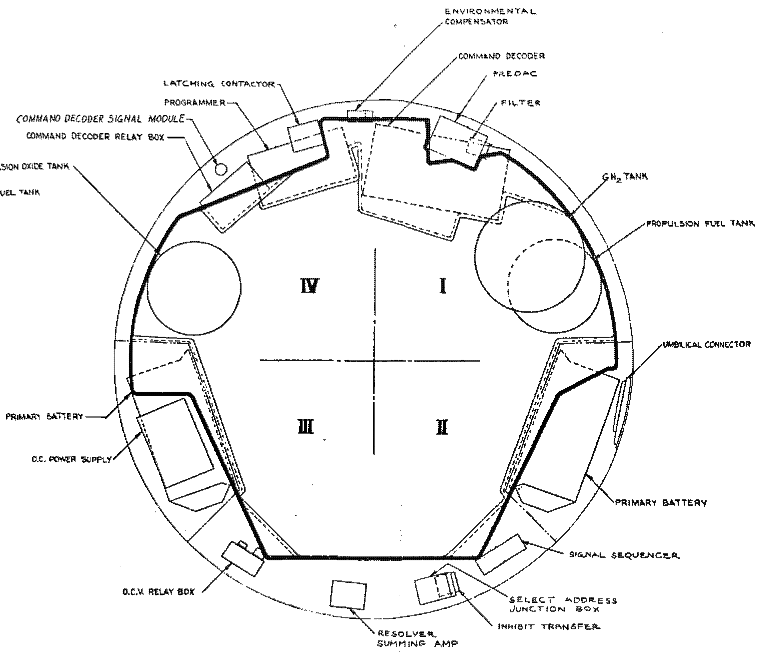


FIGURE 3-2. INBOARD PROFILE (SHEET 2 OF 5)



SECTION C-C (1A5)
STA. 180.00 LOOKING FWD



SECTION B-B (1A4)
STA. 205.00 LOOKING FWD

FIGURE 3-2. INBOARD PROFILE (SHEET 3 OF 5)

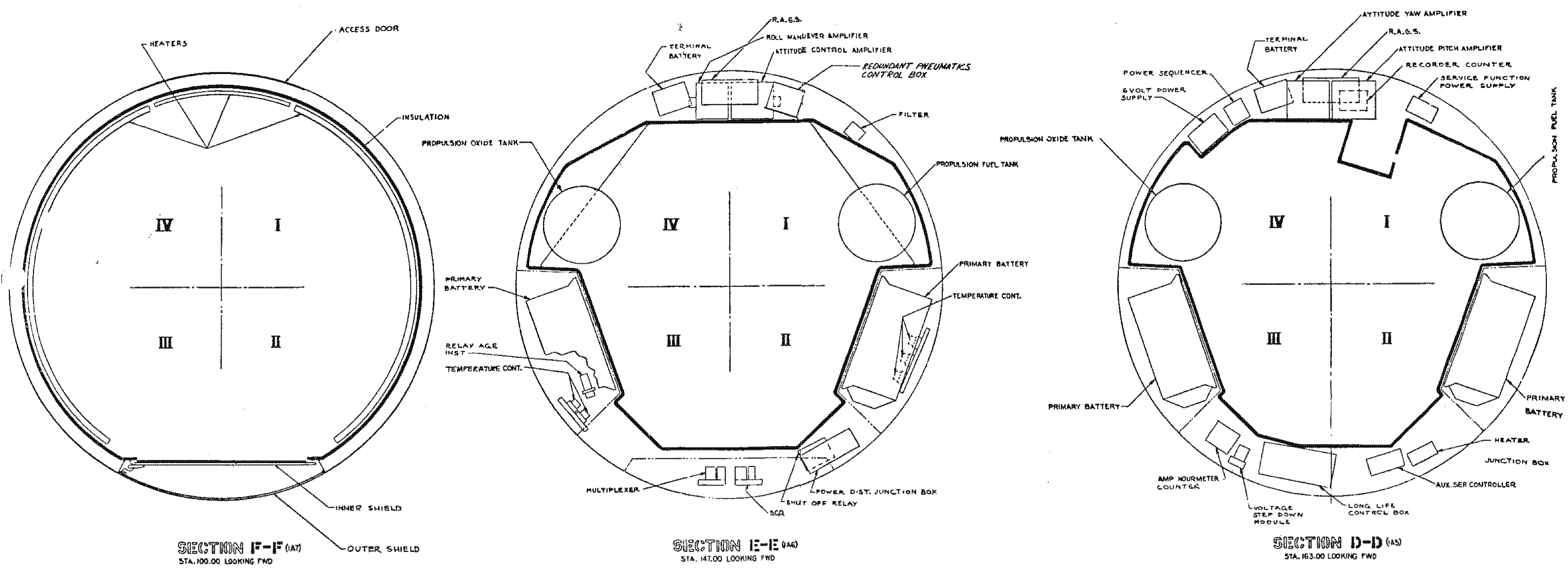


FIGURE 3-2. INBOARD PROFILE (SHEET 4 OF 5)

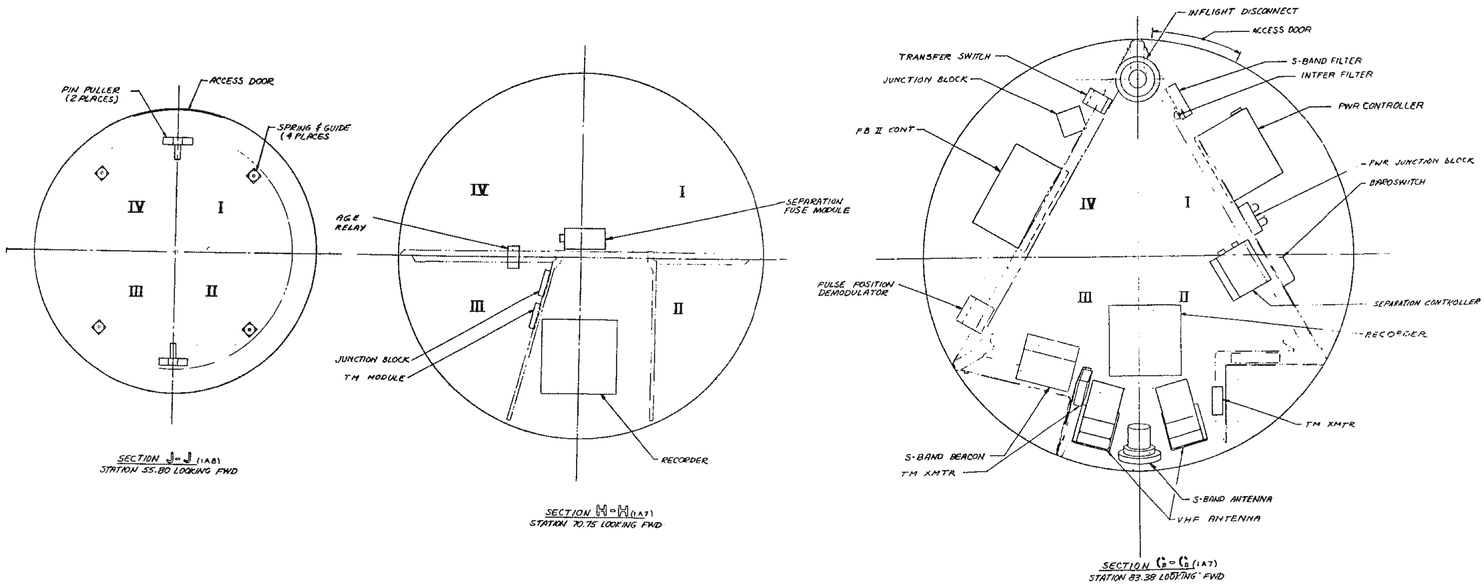


FIGURE 3-2. INBOARD PROFILE (SHEET 5 OF 5)

After Agena cutoff, all fairings and hatches are ejected and the SV is separated from the Agena. The signals for these events are initiated by stored commands from the SV command programmer. Telemetry data are transmitted during powered flight and orbit. Telemetry is programmed ON and OFF by signals initiated by the command programmer in the first one or two passes over tracking stations. An orbit ephemeris and the appropriate correction will be computed.

On the second or third pass over a tracking and command station, commands for orbit adjustment or for orbital operations are transmitted and stored. Subsequently, the ephemeris is continually recomputed and the command programmer updated over a tracking station as required. The orbit may be adjusted at times during the flight for purposes of orbit maintenance and desired changes in the orbit elements. These adjustments (velocity increment or decrement and point of application) are computed and appropriate thrust commands are generated, sent to the vehicle, stored, and executed at the specified time.

Orbit adjustment is provided by aft-firing rocket engines which utilize hypergolic propellants. Tracking to determine ephemeris and the command link is by a modified PRELORT S-band beacon. PRELORT tracking stations are located at Kodiak, Vandenberg, Kaena Point, New Boston, Guam and Pogo. The ephemeris computations are made at the Satellite Test Center (STC) at Sunnyvale, California. At this location all commands (real-time and stored) are determined for orbit adjustment, deorbit, GFE equipment, tracking, and telemetry ON and OFF. The required program of command is then transmitted through hardwire, or equivalent, to the tracking and command stations where the program is relayed to the SV. All commands not to be acted upon in real time are stored in a command programmer. These are called for execution at a time which is included in the stored command. The command programmer includes a master clock for this purpose.

The two OCV aft-firing, ablation-cooled rocket engines provide initial orbit correction and orbit adjustments as required during the mission and OCV deorbit. One solid fuel rocket engine mounted on the SRV aft surface provides the SRV deorbit impulse.

The Stabilization Subsystem operates from time of separation of the Satellite Vehicle until deorbit of the Orbital Control Vehicle. Vehicle roll and pitch attitudes are sensed from a two-gimbal platform reference and vehicle yaw is sensed by the yaw gyro. The platform is oriented in pitch and roll to be normal to the local earth vertical, which is sensed by a pair of infrared horizon scanners. The platform is oriented in yaw by sensing the roll orbital component resulting from a platform yaw error. Control torque is supplied by a cold-gas pneumatic system.

The Stabilization Subsystem prepares the vehicle for deorbit by reorienting the vehicle in 180 degrees about the yaw axis and nose down at 58.3 degrees from the horizontal. At a predetermined time, the SV programmer initiates the deorbit phase as follows:

a. Recovery programmer is armed, inhibit timer is started, and SRV telemetry battery is activated.

b. SRV thermal batteries are energized and then the OCV/A-SRV inflight disconnect is separated.

c. Pins holding the SRV to the OCV are pulled.

d. SRV is spun-up about its roll axis to approximately 60 rpm.

e. Deorbit rocket engine is fired.

f. SRV is despun to approximately 10 rpm.

g. Thrust cone is separated from the SRV.

h. SRV re-enters.

i. SRV forebody is released and recovery system is deployed.

The spin of the SRV stabilizes the vehicle and reduces to an acceptable level the dispersion effect of unbalanced torques caused by rocket engine misalignment. After SRV separation the OCV is returned to the zero pitch position. At a predetermined time the OCV rocket engines are fired by a secure command to apply a velocity decrement for deorbit. This maneuver will be timed so that the OCV impact occurs in a safe, broad ocean area. Primary mode of recovery of the SRV will be by air-snatch with backup recovery after water impact.

A backup system is provided in the event of a failure in the Command and/or Stabilization Subsystems which would prohibit proper execution of the SRV deorbit sequence. This system is called the Back-Up Stabilization System (BUSS), which provides redundant stabilization and command capability for this final orbital maneuver.

The re-entry vehicle, when properly oriented to the flight path, is made to re-enter by the deorbit rocket engine which imparts a nominal velocity of 880 fps over a period of approximately 10 seconds. An SRV telemetry transmitter and recovery beacon are active upon the initiation of the SRV separation sequence for a minimum of 10 hours thereafter. Subsequent to re-entry, the parachute thermal cover is separated from its capsule, the deceleration parachute is deployed, and the shield is allowed to fall away from the capsule. Ten seconds after its deployment, the decelerator parachute is detached from the capsule and the reefed main parachute is deployed. The main parachute is disreefed at approximately 50,000 feet. If the re-entry trajectory results in greater than a specified maximum allowable dispersion, this condition is sensed by on-board logic, causing the parachute and the shield to be deployed prematurely. The parachute is then ineffective and the capsule is destroyed by the high velocity impact and/or excessive re-entry heating.

VHF telemetry transmission of real-time and recorded data occurs from the SV during the tracking and command passes and from the OCV until OCV deboost occurs. SRV separation and deorbit data are telemetered in real-time over the SRV telemetry link.

A controlled temperature environment is achieved through passive design which controls surface emissivity and absorptivity properties, connection thermal resistance, and thermal capacitance such that no cooling is required. When cold conditions are encountered, heaters maintain the temperatures of critical components to within specified bounds.

3.2.2 SYSTEM REQUIREMENTS

3.2.2.1 Interfaces

The interface definition consists of the following:

SVS 4382	Program 206-1 Booster/SV Interface Specification
SVS 5013	PALC II/SV Interface Specification
SVS 4201	Tracking Station Interface Specification
SVS 3954C	Aerospace Ground Equipment

3.2.2.2 Launch

The launch site and launch time requirements are as follows:

Site:	Pacific Missile Range, PALC II
Time:	1200 ± 2 hours (Meridian Noon)
	2400 ± 2 hours (Meridian Midnight)

The nominal launch time may be varied to permit launch within an acceptable β (Beta) angle window. Beta angle is defined as the angle between the sun vector and the orbit plane. Beta is positive when the sun is to the left of the vehicle (view looking forward on a forward-moving vehicle). Beta is measured in degrees.

The system shall have the capability of holding on the launch pad for a minimum of six days. The time to return to the pad, if required to recycle through the MAB and VSB, shall be less than seven days and the system shall be capable of two recycles.

3.2.2.3 Powered Flight

Boost into orbit of prescribed attitude and inclination is accomplished by the SLV-3 and SS-01-B. Figure 3-3 depicts the launch configuration. The powered flight trajectory parameters used for design purposes are shown in Figures 3-4 through 3-10. Critical design limit loads evolve from consideration of winds and trajectory parameter time histories. The parameters at the critical conditions are:

Parameter	Maximum Wind Conditions	Burnout Conditions
Mach no.	1.4	---
Time after lift-off	62.4 sec	141.6 sec
Altitude	30,000 ft	171,600 ft
Dynamic pressure	880 lb/sq ft	---
Acceleration, normal	0.43 g	0.1 g
Acceleration, axial	2.01 g	7.5 g
Angle of attack	9.25 degrees	---

The maximum powered flight pitch attenuation factor shall be 1.03.

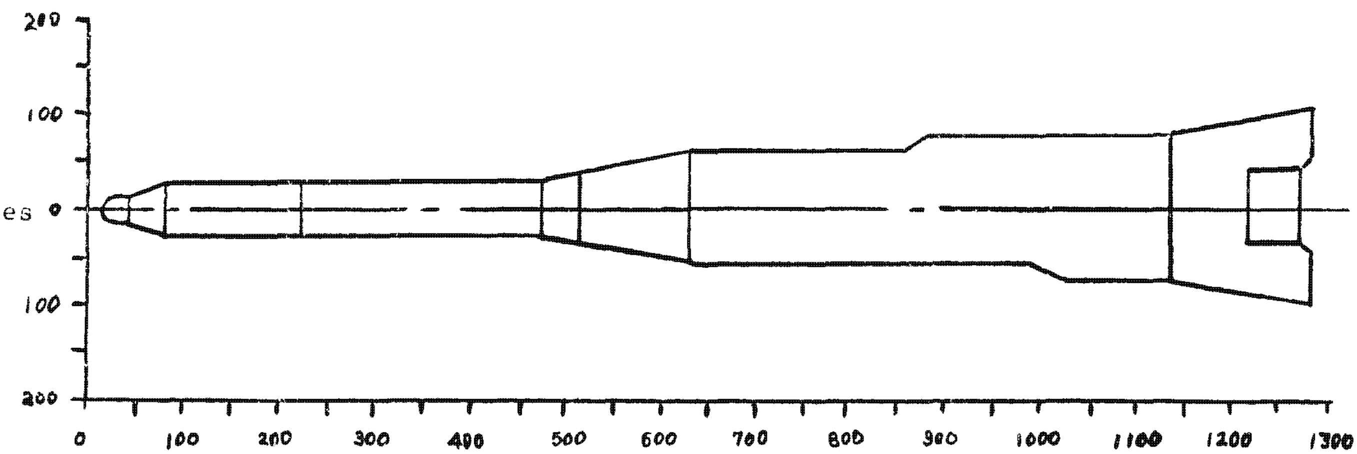


Figure 3-3. Launch Configuration

3.2.2.4 Orbit

Orbital performance requirements are as follows:

a. Injection: The SV will be injected into an orbit within the envelope defined in item c of this Section. The injection errors and orbit errors are as follows:

Item	3-Sigma Error	Average Error	Symbol
Velocity	± 55 fps	-13 fps	σ_v
Range	± 3.6 n mi	+0.56 n mi	--
Flight path angle	±0.36 deg	+0.08 deg	σ_γ
Inclination	±0.30 deg	0.15 deg	σ_I
Period	±24 ec	-5.5 sec	σ_T

b. Orbit Adjust: Velocity changes using orbit adjust may be made.

c. Design Orbits: The mission duration shall be a maximum of seven days with call-down capability. The ARDC 1962 model atmosphere will be used for the purpose of SV design. The angle of orbit inclination shall be 80 to 105 degrees. For the purpose of SV design, the orbit conditions shall be within the following bounds:

Condition	Duration (hr)	Altitude (h) (n mi)	Eccentricity	Perigee, (max)(n mi)
Injection orbit	$168<$	$83<h<150$	<0.0084	125
Corrected orbit	$105<$	$83<h<107$	<0.0020	
Cross range maneuver to deorbit	<12	$80<h<270$	<0.0250	120

d. Special Capability: The following special capability is required:

Capability	Duration (hr)	Altitude (h) (n mi)
Fly low	None, except internal RV temperature must not exceed 90°F per flight telemetry. For perigee of 70 n.mi, the apogee altitude must be adjusted to limit internal RV temperature.	$70<h<270$

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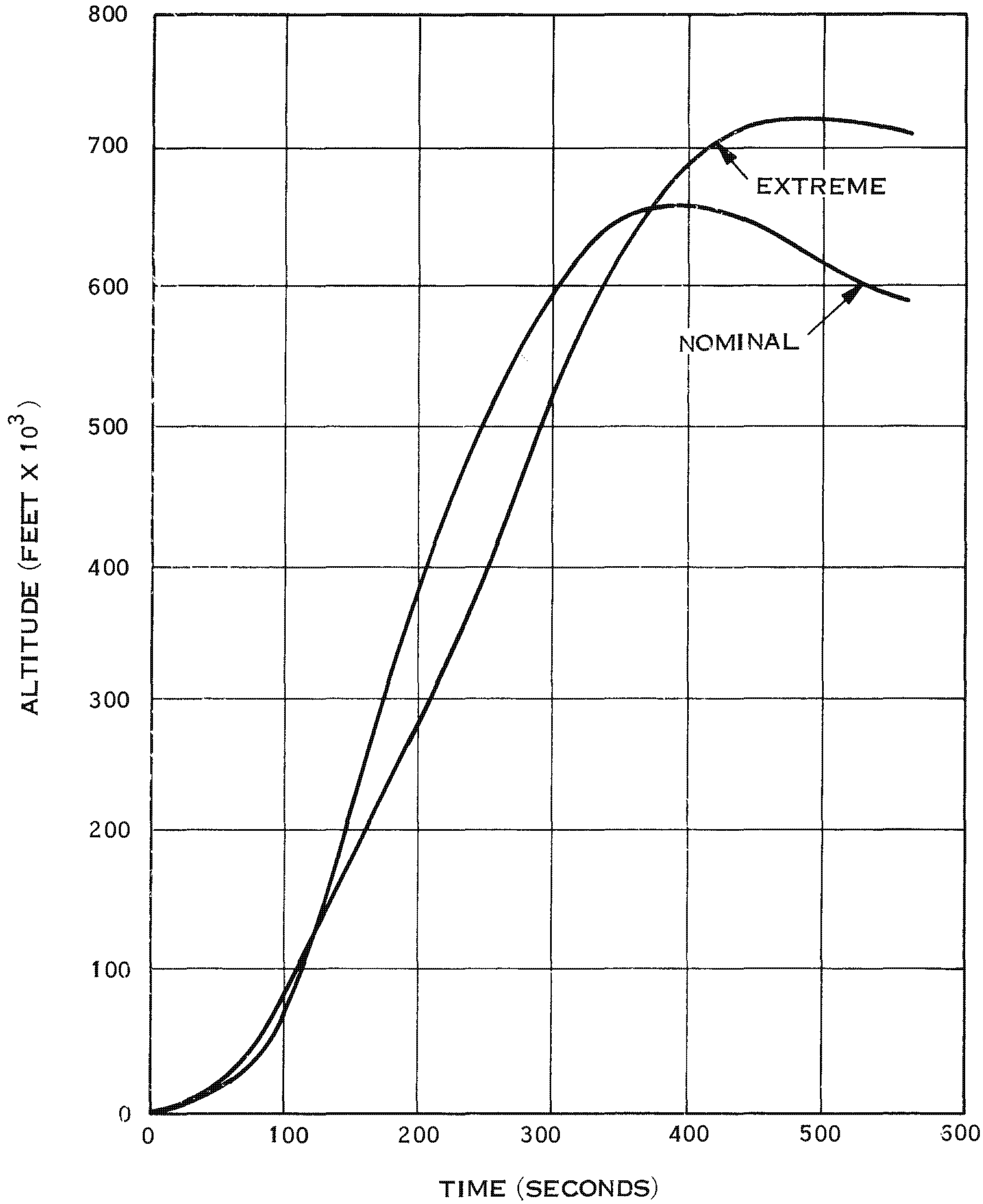

Figure 3-4. Powered Flight Trajectories (Altitude vs Time)

SVS 5364

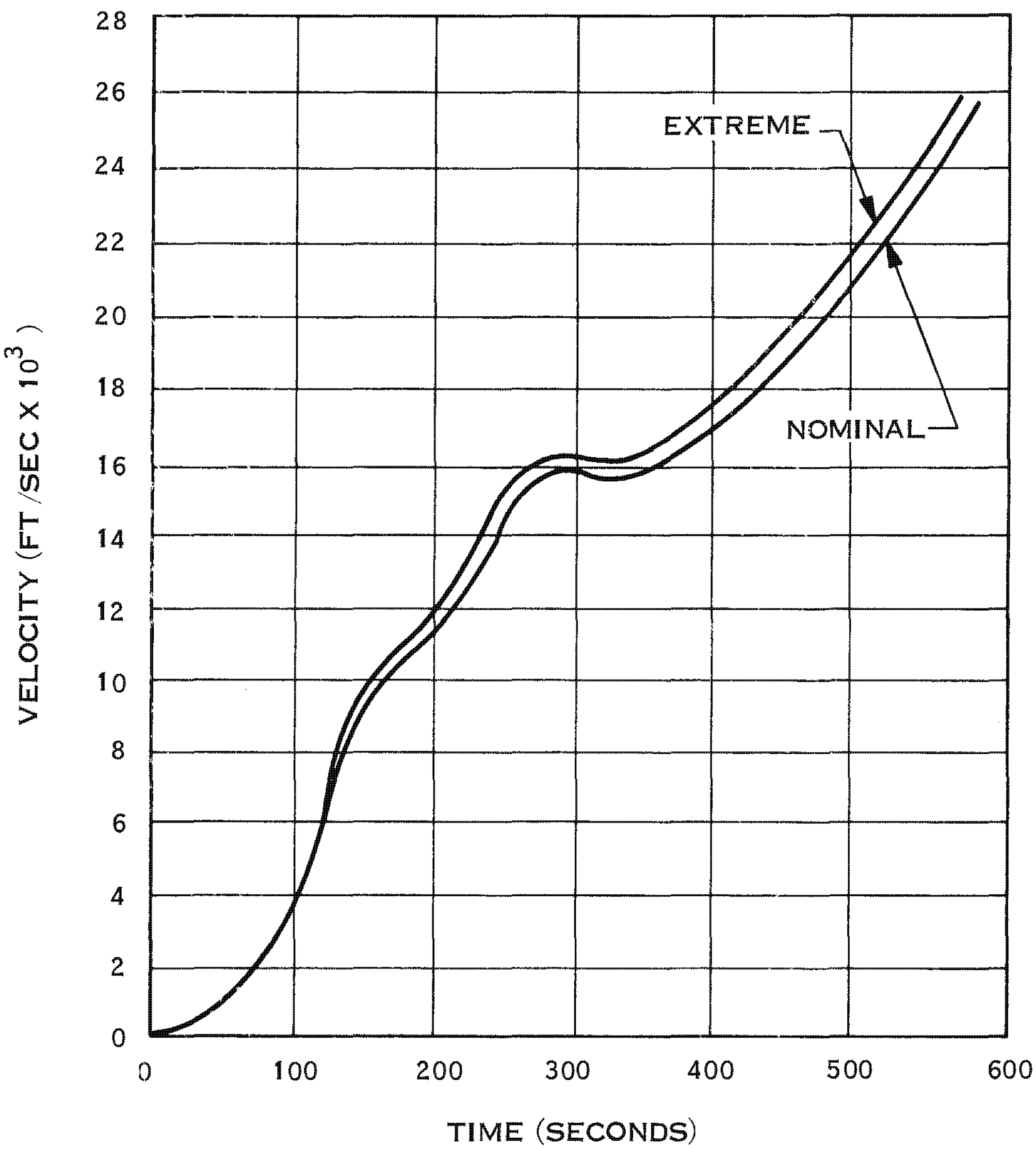

Figure 3-5. Powered Flight Trajectories (Velocity vs Time)

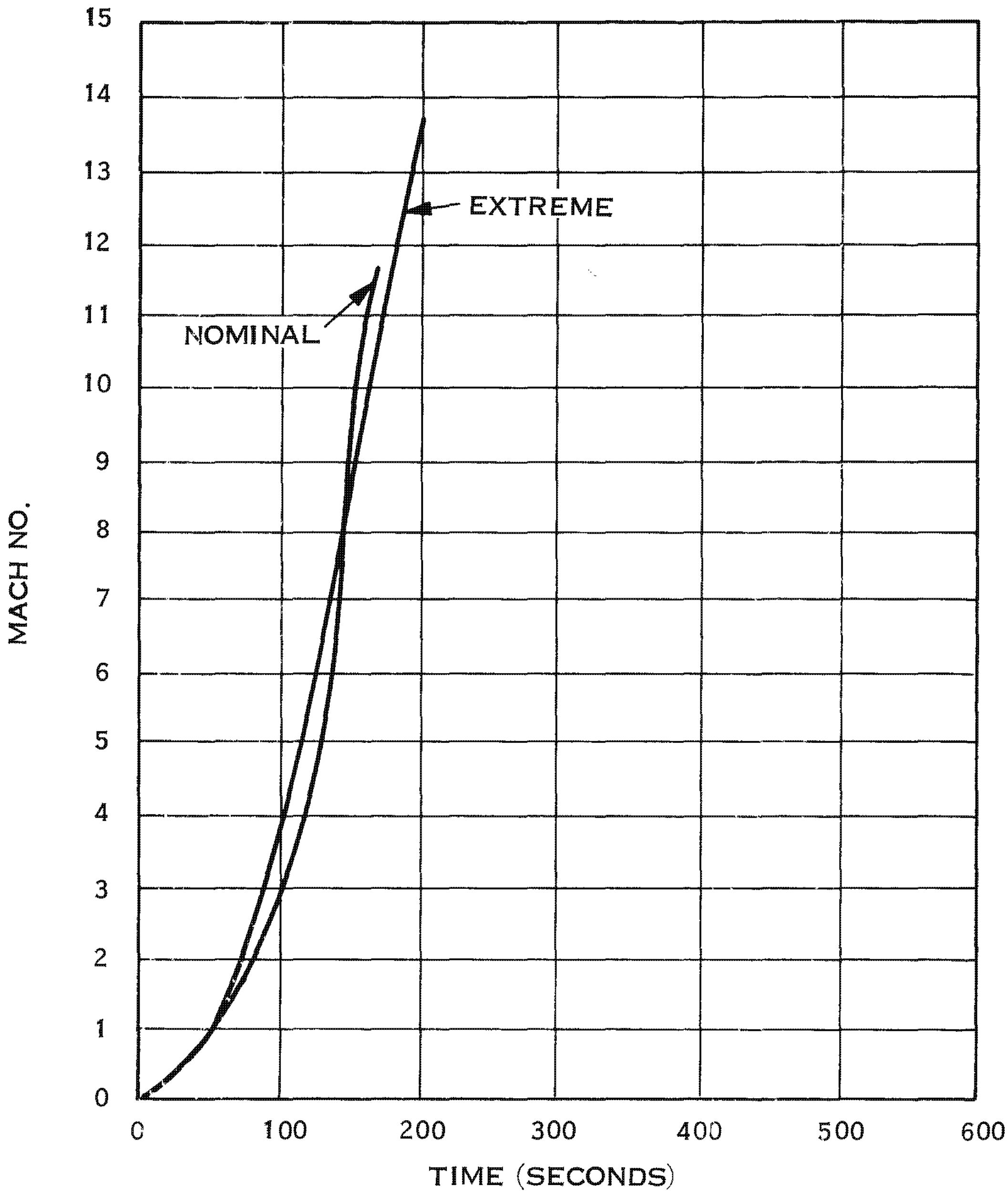

Figure 3-6. Powered Flight Trajectories (Mach No. vs Time)

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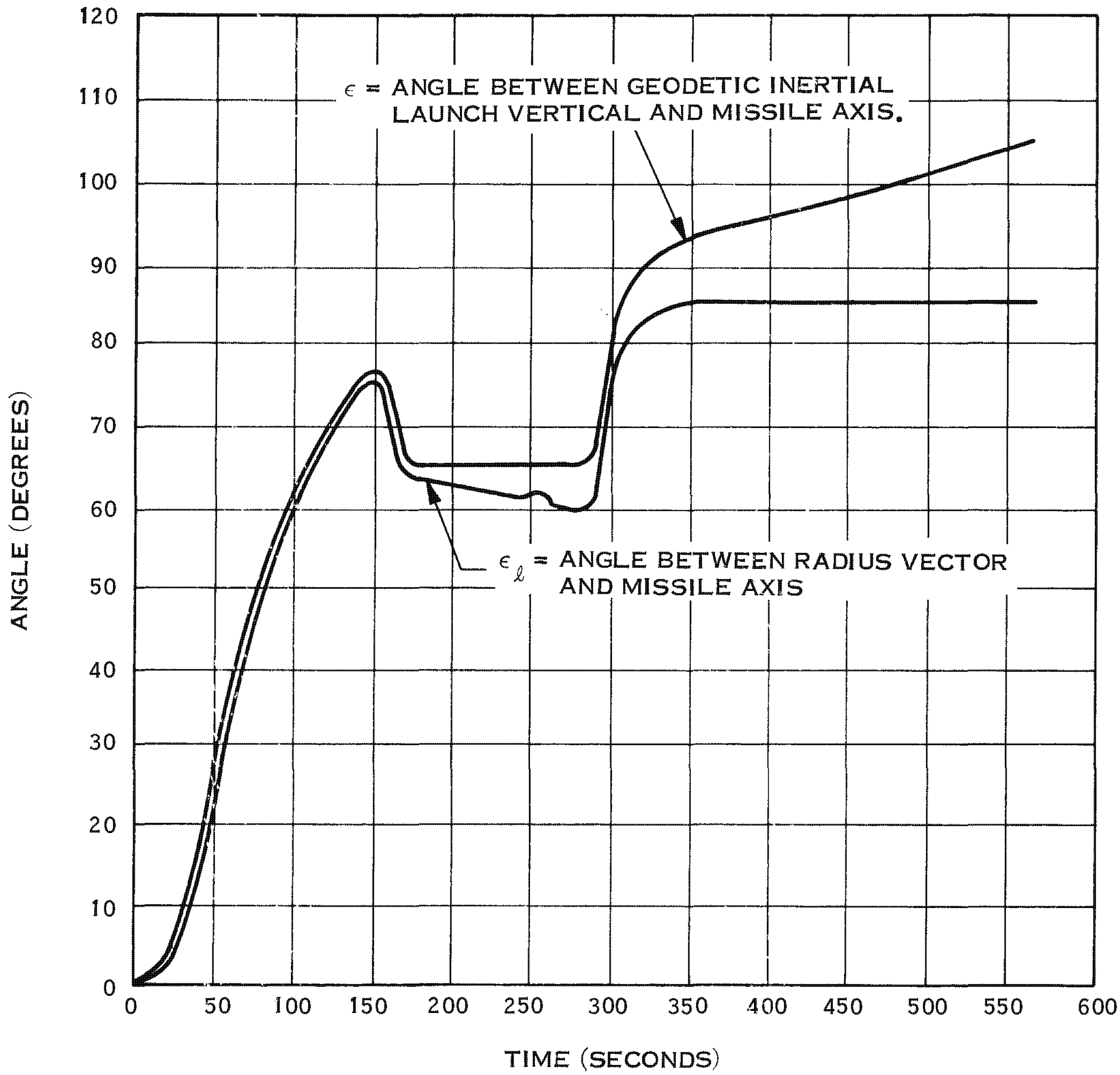

Figure 3-7. Powered Flight Trajectories (Angle Between Missile and Radius Vector)

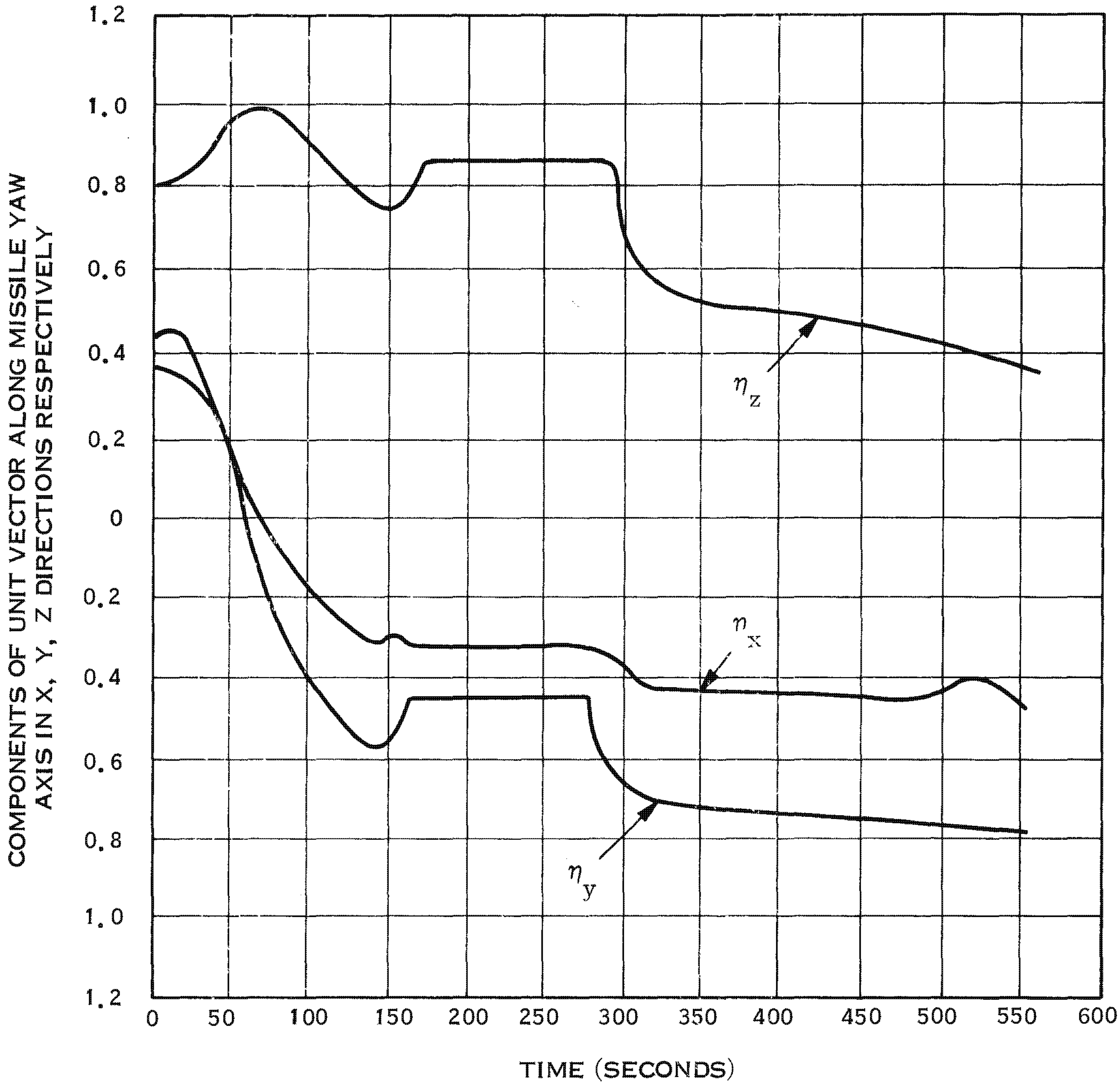

Figure 3-8. Powered Flight Trajectories (Unit Vector Components Along Missile Yaw Axis)

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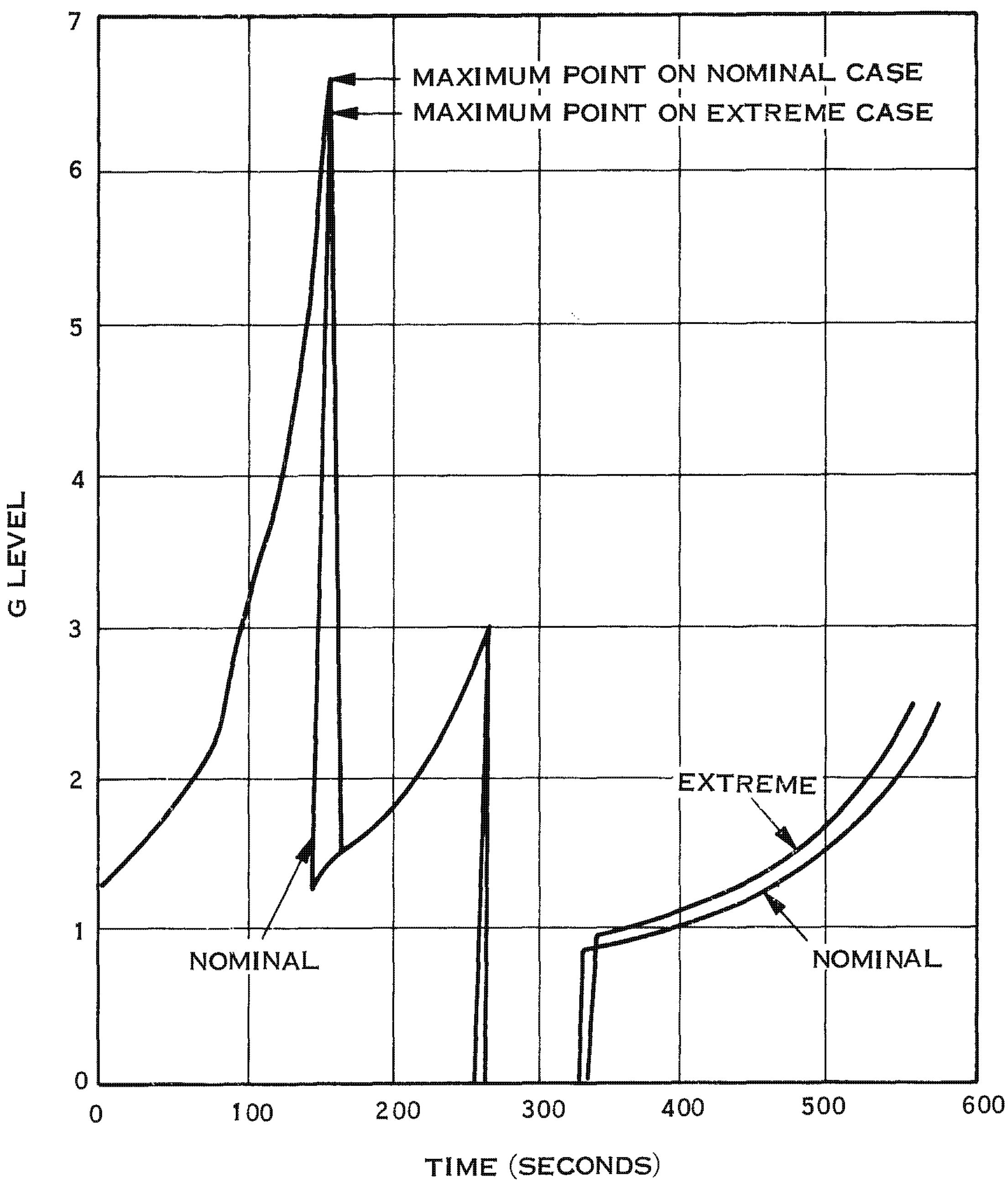

Figure 3-9. Powered Flight Trajectories (Axial Load vs Time)

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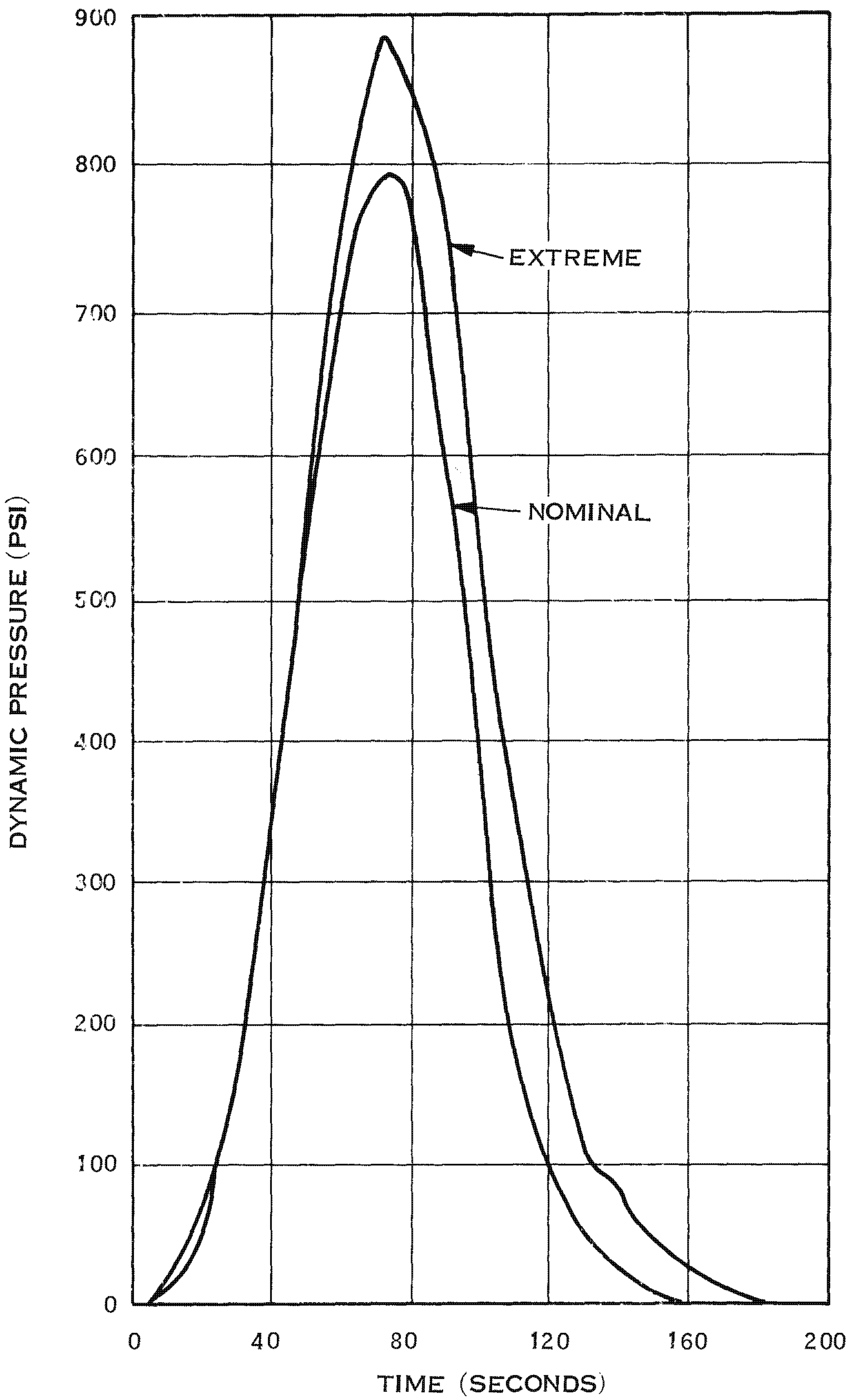


Figure 3-10. Powered Flight Trajectories (Dynamic Pressure vs Time)

3.2.2.5 Deorbit

The parameters for deorbit design shall be as follows:

Item	Requirement
Altitude at deorbit	80 to 120 n mi
Eccentricity	0 to 0.025
Deorbit retro velocity	880 ft/sec (nominal)
Inclination	80 deg to 105 deg
Direction	From north or south (from north only, with BUSS)
Deorbit time	Day or night
Impact location	24 deg N (nominal)
	158 deg W (nominal)

3.2.2.6 Retrieval

Primary retrieval of the capsule shall be by air snatch over an ocean area. Impact shall occur no later than the end of the seventh day. In the event of a failure to air snatch and subsequent water impact, the recoverable shall float and search aids shall operate for a minimum of 10 hours; the SRV capsule shall sink if recovery has not been accomplished within 55 to 95 hours. Retrieval of the capsule shall not be inhibited if downrange dispersion is less than 1400 n mi, and shall always inhibit for an overshoot of greater than 3200 n mi. Actual inhibit range will vary with orbital parameters.

3.2.2.7 Dispersion

Dispersion requirements are as follows:

a. Satellite Recovery Vehicle: Dispersion error goals shall be:

3-Sigma Error (root sum square)	Dispersion, Primary System (n mi)	Dispersion, BUSS (n mi)
Range	± 75	± 220
Cross range	± 7.7	± 40

b. Orbital Control Vehicle: Dispersion error goals at impact shall be:

3-Sigma Error (root sum square)	Dispersion (n mi)
Range	± 250
Cross range	± 50

Deboost of the OCV shall be contingent upon an incremental velocity (ΔV) capability of 290 ft/sec being available for the maneuver. If such a capability is not left at the end of the mission, the OCV will be allowed to decay naturally until the predicted impact revolution. The orbit adjust engines will then be operated to ensure impact in an ocean area.

3.2.2.8 Reliability

The reliability goals for the complete system and for each subsystem are as given in Table 3-1.

Table 3-1. System and Subsystem Reliability Goals

Subsystem	Design Goal	Inherent Design Reliability (max)
Telemetry, Tracking and Command; in-line Telemetry	0.989	0.954
Separation	0.999	0.999
Orbit Adjust	0.986	0.999
Stabilization	0.989	0.954
Electrical Power and Signal Distribution	0.996	0.992
Environmental Control	0.999	0.999
SRV	0.991	0.986
Total System	0.95	0.89

3.2.3 TYPICAL FLIGHT SEQUENCES

3.2.3.1 Separation and Attitude Control Acquisition

This phase consists of the sequence of events related to SV/SS-01-B separation and acquisition of attitude control by the SV. The separation time is stored prior to launch and is not functionally controlled by an injection event such as SS-01-B booster cutoff. Sufficient time is allowed between SS-01-B engine cutoff and SV/SS-01-B separation for the SS-01-B to settle to acceptably small rate and position attitude errors. All command functions for this phase will have been stored in the SV prior to launch. The sequence includes SV/SS-01-B separation, SV pneumatics activation, earth acquisition by the IR scanner system, and SV settling to a controlled orbital attitude with the yaw axis aligned to the local vertical and the roll axis aligned to the orbital plane.

3.2.3.2 Initial Orbit Correction

An initial orbit correction would be required to correct for an injection which was biased high (or low). Sufficient tracking data are obtained to compute the desired velocity decrement (increment), and nominally the correction would be made during the first day. Normally, an initial orbit correction would require two engine firings.

3.2.3.3 Typical Station Pass Operation

Station pass operation is normally based on the following conditions: Tracking and telemetry operation is accomplished through a 0-degree cone coverage while the command function is carried out during the time the vehicle is in a 5-degree cone. Not all station passes are utilized. Choice of station pass operation is chosen by the flight controller.

The complete command function utilizes the real time telemetry, S-band beacon, pulse position demodulator (PPD), command decoder, and command programmer. Telemetry and the S-band beacon are employed for the telemetry and tracking function. The PPD controls the command insertion capability and is utilized only within the 5-degree cone. The following telemetry, tracking and command equipment (S-band beacon, telemetry, PPD and command decoder) are turned on by stored commands. It is important to note that the Telemetry, Tracking and Command (TT&C) equipment cannot be activated by real-time commands (RTC); thus, initial TT&C ON commands must in each case be stored during previous station passes. To prevent possible loss of SV command, tracking, and telemetry capabilities, a BUSS secure command can also be used to command the PPD ON. The pulse position demodulator is always turned off by RTC (as soon as usage is completed), backed up with PPD OFF stored command executed when the vehicle is leaving the 5-degree cone. Beacon and telemetry are turned off by stored command with a 6- or 12-minute backup turn-off capability. The PPD is also turned off by the 6- or 12-minute backup capability.

3.2.3.4 Orbit Maintenance

Because of orbit decay or other variations, one or more orbit maintenance or correction functions may be required. These functions will be performed at various times during the mission.

3.2.3.5 Cross-Range Maneuver

The purpose of the cross-range maneuver is to place the SV at the appropriate deboost point at some later orbit. This maneuver is accomplished by a change in orbital period at the proper time prior to SRV deorbit.

3.2.3.6 Deorbit Preparation

Deorbit preparation consists of attitude positioning of the SRV for deorbit; i.e., the SV performs a yaw-around and pitch-down maneuver. This is followed by a series of events which transfer control to the SRV and accomplish electrical and mechanical separation of the SRV from the OCV/adapter.

3.2.3.7 SRV Terminal Phase

Following mechanical separation of the SRV from the OCV/Adapter, the SRV is spin stabilized by means of cold gas jets. The solid rocket is fired (to achieve deorbit) followed by despin. The deorbit hardware is then separated to allow parachute deployment after re-entry has been successfully negotiated. To aid in retrieval operations, use is made of an RF beacon, a telemetry transmitter, and a flashing light.

3.2.3.8 OCV Deorbit

OCV deorbit time is governed by impact area considerations and remaining OCV capability. Nominally, the OCV is deorbited within the next orbit after SRV separation, and the OCV impacts in the same approximate area as the SRV. After SRV separation, the OCV is returned to zero pitch angle (flying reverse). At the deboost point the OCV engines are fired to impart deboost velocity.

3.3 SATELLITE VEHICLE SYSTEM REQUIREMENTS

NOTE: Descriptive sections of this Specification are presented for information purposes only. In case of any ambiguity or conflict in requirements, the specific requirement shall prevail over the description.

The Satellite Vehicle system shall consist of the following subsystems, the detailed requirements of which are defined in the listed specification:

Tracking and Command / Telemetry and Instrumentation	SVS 3969E, Supp 10
Separation	SVS 4475B
Environmental Control	SVS 4490A
Electrical Power and Signal Distribution	SVS 5288
(Harness)	SVS 5289, Rev. A
Stabilization	SVS 5357
Orbit Adjust (Including OCV orbit ejection)	SVS 3995E
Structure (Orbital Vehicle less SRV)	SVS 5177
Satellite Recovery Vehicle (including structure)	SVS 5283A
Back Up Stabilization System	SVS 5005-1
Telemetry, Tracking and Command (TT&C)	SVS 4400C, Supp 4

3.3.1 TRACKING AND COMMAND SUBSYSTEM

3.3.1.1 Description

In addition to the following, the TT&C requirements are defined in SVS 3969E, as modified by Supplement 10.

a. Tracking: The Tracking Subsystem provides RF tracking aid for locating, identifying, and tracking the vehicle during powered flight, orbit, and re-entry. The aids include an S-band (modified PRELORT) transponder and two VHF telemetry transmitters in the OCV/Adapter. The SRV contains a telemetry transmitter and a beacon transmitter. The OCV and Adapter components are used in powered flight, orbit, and OCV/Adapter deboost. The SRV components are activated at, or before, SRV/Adapter separation and are employed as recovery aids.

b. Command: The Command Subsystem receives binary sequences via hardwire during ground test or via the S-band beacon, where each bit of the sequence is demodulated from a specific position of the center pulse of a three-pulse burst by the pulse position demodulator (see radar pulse position in Section 3.3.1.3.2). If the position format is acceptable, non-return to zero (NRZ) data and a Bit-Read Pulse are sent to the command decoder. The command decoder intercepts the sequences in 7- or 37-bit groups according to the placing of a word-start/end-of-word marker (S Pulse) similarly demodulated. The sequences will be subjected to certain consistency checks and an Accept or Reject pulse will be returned via a telemetry channel. The command decoder (in the real time mode) will interpret 7-bit commands and cause the corresponding function to be executed immediately. The command decoder (in the storage mode) routes 37-bit commands to the memory of a command programmer. The command programmer interprets 23 binary and 1 parity bit as the system time at which time the remaining bits of that command will be read out to the command decoder (in the real time mode). The system time is generated by a binary clock located in the command programmer. The command decoder (in the real time mode) interprets the bits read to it from the command programmer and initiates, at the proper time, corresponding commands or an implicit sequence of commands to be performed. The primary Command Subsystem may also be turned on through the BUSS command link. An unsecure command energizes the PRELORT beacon, while a secure command turns on the PPD and the command decoder. Turn-off is backed up by the reset six-minute timer.

3.3.1.2 Security

Security shall be provided by two distinct methods. First, the PPD (through which commands enter the orbiting vehicle) is to be turned on by a stored command or via BUSS, only at times selected by the flight controller. These times are intended to be only when the satellite vehicle is within a 5-degree conical section whose apex is at the Tracking Station. A stored command or a real time command shall turn off the PPD at times selected by the flight controller, generally before the vehicle leaves the 5-degree cone, although the following automatic features shall be provided.

a. Turn-off 6 minutes after the last stored command execution.

b. Turn-off 6 minutes after turn-on.

c. Turn-off 12 minutes after turn-on.

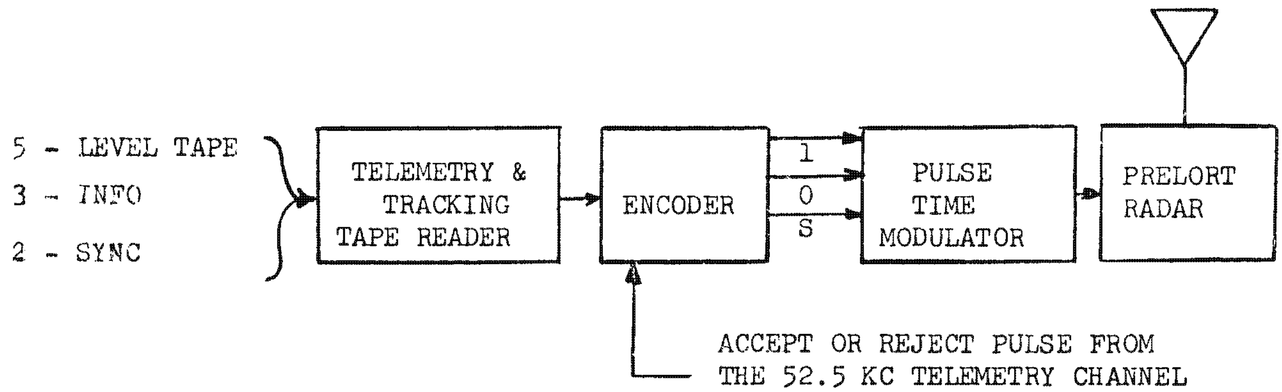
d. Turn-off 12 minutes after execution of the last stored command.

Second commands relating to all OCV engine firings and SRV rocket firing are secured (directly or indirectly) against unauthorized initiation. Security is achieved with a 36-bit key in the command word. A secure word match in the command decoder is required for the execution of secured command. This word changes each time the pulse position demodulator is energized whether by a stored or BUSS command. There are 128 different words (secure count on telemetry ranges from zero to 127) randomly chosen before flight and wired into a matrix on the secure plug in the command decoder. The number of the current word is transmitted to the ground via telemetry. After the 128th word is reached (telemetry secure count of 127), there is no further secure word advancement.

3.3.1.3 General Command System Requirements

3.3.1.3.1 Ground System

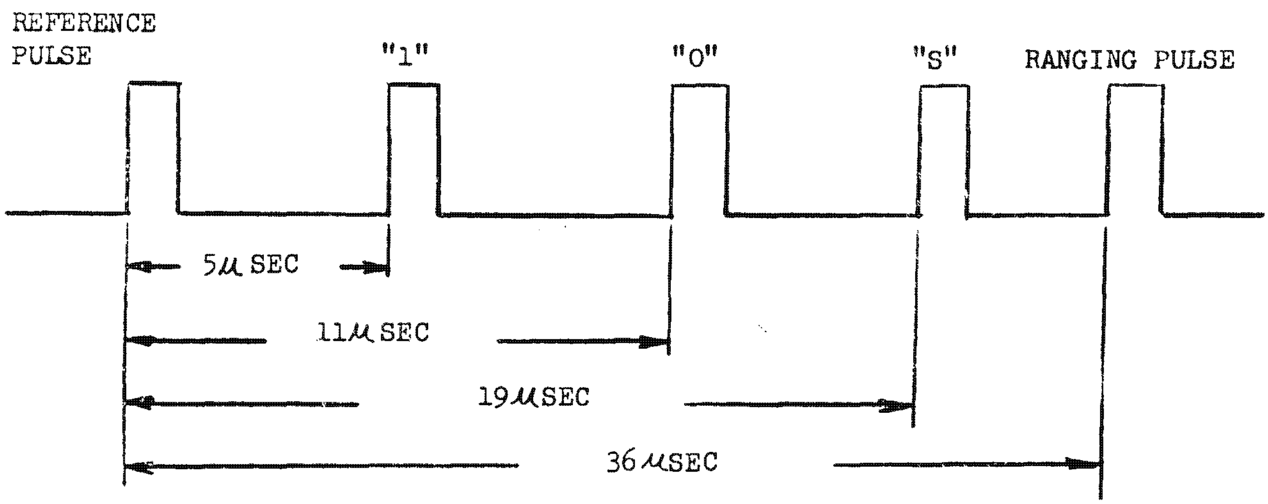
The tracking station ground system shall consist of an encoder, a pulse timer modulator, and a PRELORT radar:



When an Accept pulse is received via telemetry, the next command shall be sent. When a Reject pulse is received via telemetry, the command shall be repeated until accepted up to a selectable repetition sequence of seven rejects. If the encoder receives the selected number of rejections (maximum of seven rejections), the command tape shall not advance to the next word and commanding will be stopped, unless a manual override function is performed.

3.3.1.3.2 Pulse Format

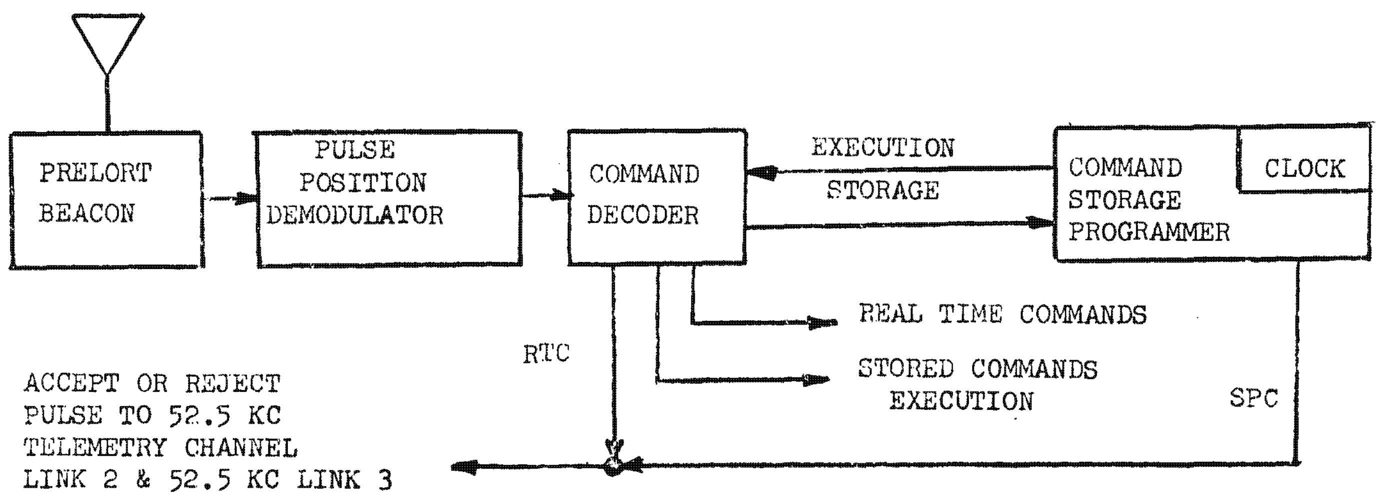
The radar pulse position format shall be as follows:



Tolerance on pulse spacing is ± 0.3μ sec. Pulse width shall be 0.8 to 1.5μ sec at 50% level.

3.3.1.3.3 Airborne System

The airborne system shall consist of a beacon, a pulse position demodulator, a command decoder, and a command storage programmer. The programmer shall include a digital clock which shall be accurate to one in one million. The random clock drift shall not exceed 50.4 milliseconds per day. The airborne system is as follows:



3.3.1.3.4 Beacon Output and Frequency Requirements

The PRELORT (S-band) beacon link operates at a 1.0 kw minimum peak power output into a circularly polarized, flush-mounted, cavity antenna which has a VSWR of 2:1 maximum in a bandwidth of 2845 to 2925 mc. The tracking frequency will be 2850 ± 2 mc and the transponder frequency will be 2920 ± 2 mc.

3.3.1.3.5 Command Decoder (See Figure 3-11)

a. Command Categories: There shall be three categories of commands characterized as shown in Table 3-2.

b. Capacity: The command equipment shall have the following capacity:

1. Real Time Commands: 16 words

Table 3-2. Command Categories

Category	Bits Transmitted Per Command	Bits Stored Per Command	Function (Number of Different Commands)
Real Time command	7		(6) Stab (9) TT&C (1) EP&D
Single stored program command (SSPC)	37	40	(7) Tracking, Command, & TLM power control (3) GFE (2) PIG (3) G&C select dead band (1) Spare
Double stored program Commands (DSPC)	74	80	GFE Activate secure command, operate attitude control Activate Remote BUSS execute Misc. events, spares

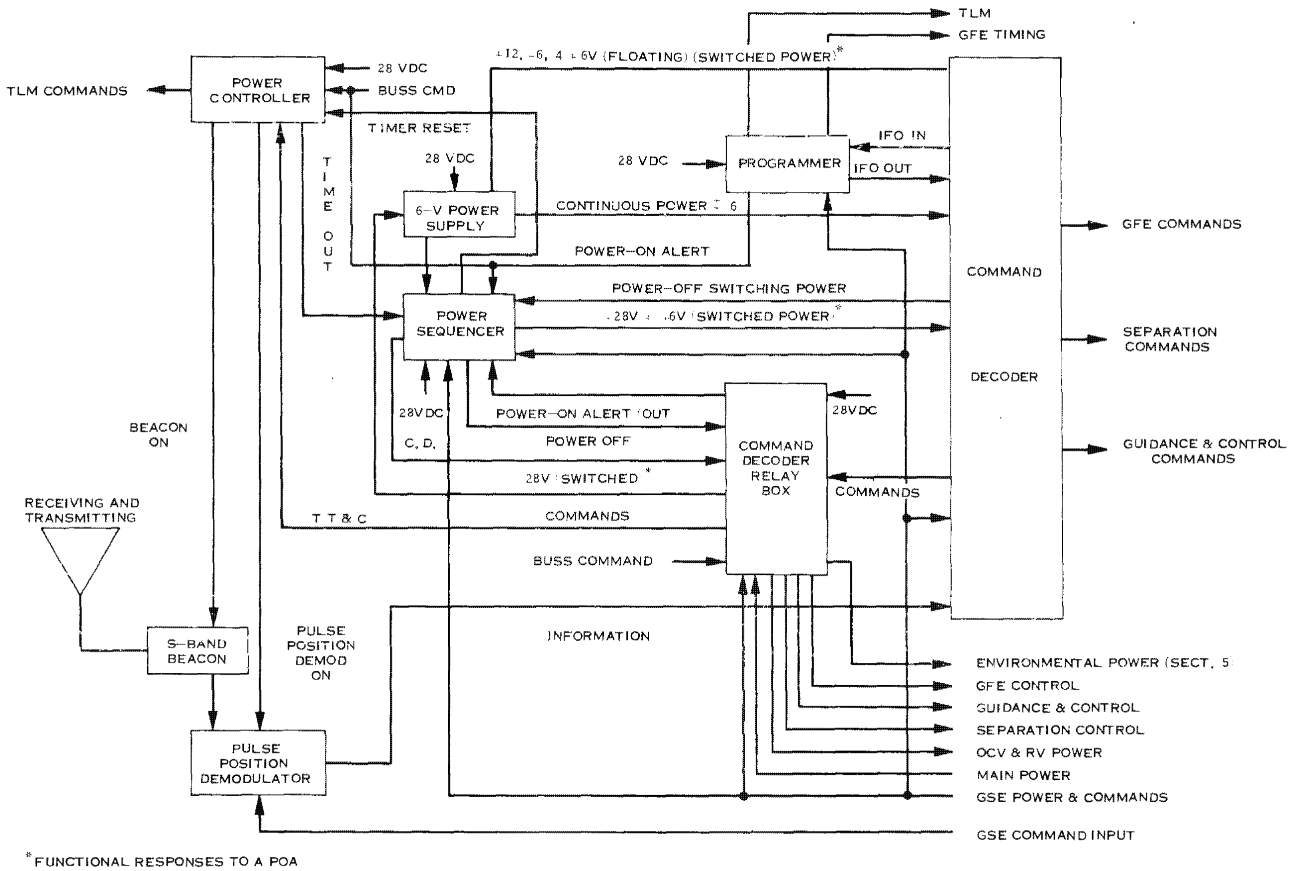


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FIGURE 3-11. TRACKING AND COMMAND SUBSYSTEM

2. Stored Program Commands: Four storage lines, each being able to hold 99 single-stored program commands (40 bits each), or 49 double-stored program commands (80 bits each), or any combination of SSPC and DSPC (3960 bits total).

c. Outputs: Stored commands shall be executed with a time resolution equal to that of the digital clock (0.1 second). Outputs from the command decoder and command decoder relay box shall be as follows:

1. Command Decoder: Device is transistor switched at the following levels:

(a) 6 volts, current $\leq$ 6 milliamperes.

(b) 28 volts or ground, current $\leq$ 100 milliamperes.

2. Command Decoder Relay Box: Device is relay switched, with the following ratings:

(a) 28 volts or ground, 10 amperes or 1 ampere.

The output signal duration from both command decoder and the relay box shall be one of the following:

1. 20 $\pm$ 4 milliseconds.

2. 64 $\pm$ 16 milliseconds.

3. 150 $\pm$ 75 milliseconds.

4. Continuous.

d. Command Function Allocations: Command functions shall be assigned to the various bits of the three types of command categories in accordance with Appendix F of the System Acceptance Specification, SVS 5388.

3.3.1.3.6 SRV Beacon

The beacon used as a recovery search aid in the SRV shall have the following characteristics:

a.	Frequency	235.0 mc $\pm$ 0.01%
b.	Operating voltage	13 $\pm$ 1 VDC
c.	Power (average)	400 milliwatts minimum (50% duty cycle)
d.	Modulation	Sweeps from low to high frequency
e.	Modulation frequency band	200 to 1500 cps

f.	Modulation excursion	500 cps minimum within the frequency band
g.	Sweep rate	1 to 3 cps
h.	Loading	V.S.W.R. 2:1 maximum
i.	E.M.I.	Less than 55 dbm

3.3.1.4 AGE Provisions

a. Prelaunch: Capability shall be provided for insertion of both real-time and stored commands into the Tracking and Command Subsystem via hardwire, with or without activating the PRELORT beacon. The PRELORT beacon may also be used for insertion of commands. Verification of command insertion shall be obtained from the 52.5-kc telemetry channel via hardwire. The clock in the command storage programmer shall have the capability of being started, RESET to zero, put on FAST COUNT, or being put on HOLD via hardwire.

b. Additional Capabilities: The AGE shall also provide a capability for the following:

1. Turn on the telemetry, tracking, and command equipment.
2. Turn on and off GFE environmental power.
3. Turn on SRV beacon.
4. Reset command decoder.
5. Initialize command decoder relay box, power controller.
6. Inhibit S-band beacon.

3.3.1.5 Operational Command Software

3.3.1.5.1 Description

The Operational Command Software shall provide specific instructions for commanding the Satellite Vehicle. It shall consist of three documents:

a. Input Output Format Specification

b. Command Definition Specification

c. Operational Software/Hardware Considerations & Limitations Spec.

Each of these documents shall provide an interface between the Satellite Vehicle and the Command Computer Programs at the STC.

3.3.1.5.2 Requirements

3.3.1.5.2.1 Input Output Format Specification

The Input Output Format Specification shall define the procedure for inputting desired instructions and/or desired changes to the data package into the Command Computer Program at the Satellite Test Center, Sunnyvale, California. It shall identify the formats, contents, and column locations of all data fields for all types of input cards.

Input cards shall be specified for the following Computer Program Modules:

Module Name	USAF Computer Program Library Reference No.
GEEX	H95AL
GCONTACT	H97AG
GCOMINT	H99WF
GTELIM	J07WM
GMPESCHN	J02AJ
GPRESENT	J05AL
GTERMIN	H98AH
GTPOT	J24AE
GCHAP	H96AI
GBUSS	L91AG
GCOAT	M62AD
GALOOT	M69AE
GTORBEL	N01AD
GCOMMAND	J00WN

The Input Output Format Specification shall define the printout formats for the following modules:

GCALL	H94AI
GCONTACT	H97AG
GCOMINT	H99WF
GTELIM	J07WM
GMPESCHN	J02AJ
GPRESENT	J05AL
GTERMIN	H98AH
GTPOT	J24AE
GCHAP	H96AI
GBUSS	L91AG
GCOAT	M62AD
GALOOT	M69AE
GTORBEL	N01AD
GCOMMAND	J00WN

3.3.1.5.2.2 Command Definition Specification

The Command Definition Specification shall define commands and command sequences which shall be available within the Command Computer Program to provide facilitated operational control of the orbiting spacecraft.

Specifically, the Command Definition Specification shall provide for each command type, the identification of the function performed by each bit (or matrix of bits), the significance of the state of each bit ("1" or "0"), and a cryptic identification of each bit for easy interpretation of command list printouts.

This specification shall establish a library of frequently used commands. Each of these commands shall be identified by number, type, functions executed, the specific bit format, and the command sequences in which it is used.

Command sequences shall be identified for frequently used series of executions. Each sequence shall be identified by a name and number. They shall identify the commands contained therein, the relative times of command executions, and the relative order of command loading.

3.3.1.5.2.3 Operational Software Hardware Considerations and Limitations Spec.

The Operational Software/Hardware Considerations and Limitations Specification shall define restrictions upon the operation of the spacecraft. These limitations will be those that could occur within the capabilities of undesirable (or even catastrophic) consequences.

3.3.1.5.3 Limitations

Operational Command Software shall provide operating instructions and limitations. It shall not protect against any improper operation of the spacecraft either caused by human error or by direct intent.

3.3.2 TELEMETRY AND INSTRUMENTATION SUBSYSTEM (TLM)

In addition to the criteria specified herein, the telemetry and instrumentation requirements are as specified in SVS 3969. The telemetry allocation shall be in accordance with the System Acceptance Specification.

3.3.2.1 Description

The Telemetry and Instrumentation Subsystem senses and samples system functions, events, status, and mission conditions; converts sensed signals; records and transmits in orbit; and transmits re-entry functions.

3.3.2.1.1 Configuration

The Telemetry and Instrumentation Subsystem is configured as follows:

a. The telemetry equipment includes two RF links in the Adapter and one RF link in the SRV with the necessary drivers, conversion, and multiplexing equipment.

b. The Telemetry Subsystem in the OCV/Adapter is capable of providing data during powered flight, orbit, and separation phases of the mission.

c. The normal mode of operation of the two RF links in the adapter is for both to transmit real-time data, although the second link may be commanded to transmit playback data from the recorder.

d. A data recorder shall be supplied in the Adapter for recording telemetry data upon execution of the appropriate stored command while the vehicle is out of contact with ground stations.

e. The recorder is capable of being started and stopped in both the Record and the Playback mode upon command by the command programmer.

f. The telemetry transmitter, with its associated equipment in the SRV, is energized shortly before SRV separation. Post separation and re-entry events and data are transmitted via this telemetry link in real time. The telemetry signal may also be employed as a tracking aid.

3.3.2.1.2 Hardwire Provisions

Provision is made for the capability of obtaining complete telemetry readout from the telemetry equipment in the OCV/Adapter via hardwire without the energization of the RF transmitters. Further provision is made for the following, via hardwire, for ground test:

a. External power to SRV telemetry.

b. Reset SRV telemetry.

c. Sensor excitation.

d. Turn on TT&C equipment.

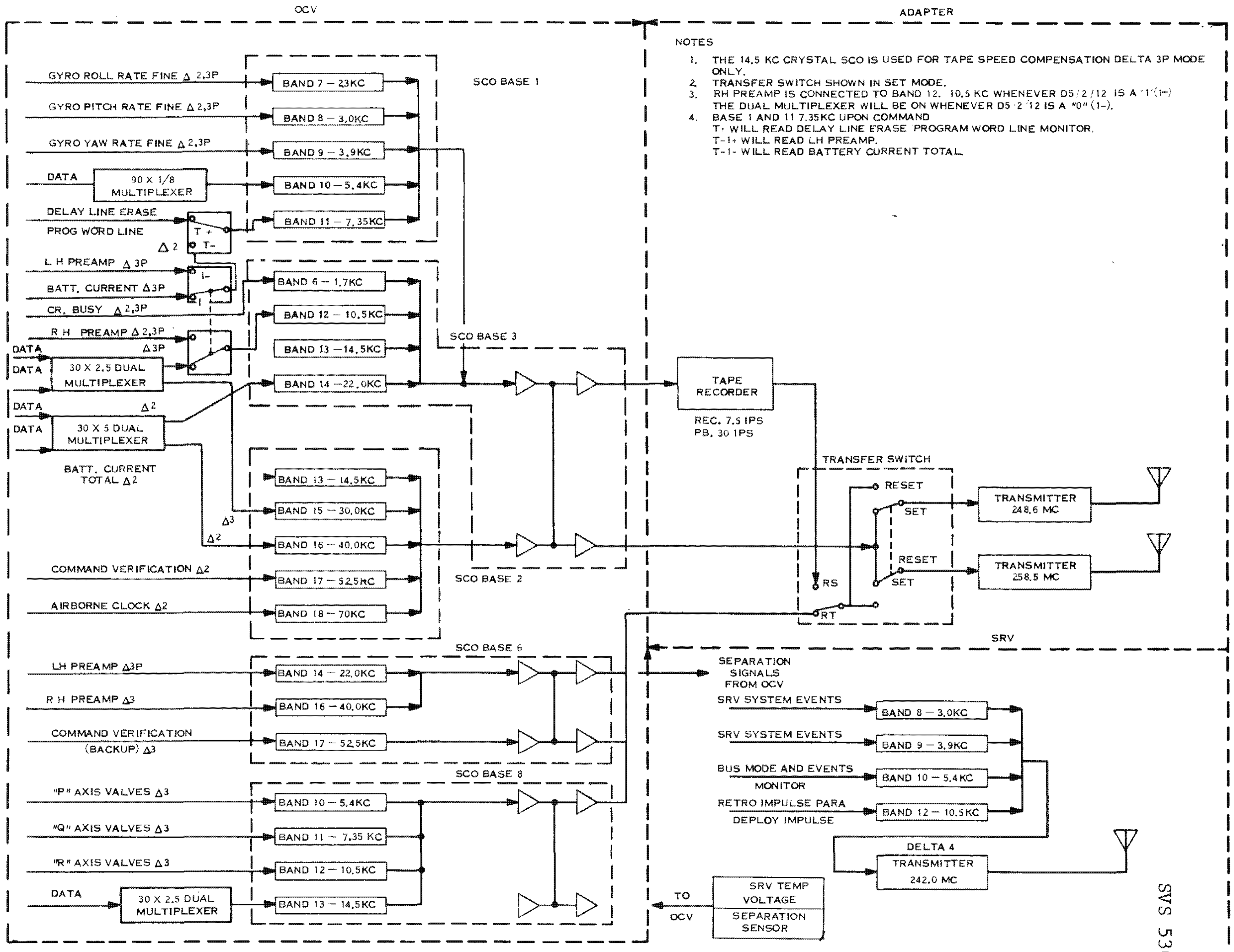
e. Inhibit turn-on of OCV/Adapter telemetry transmitters.

f. Cage Gyro.

g. External vehicle power.

3.3.2.1.3 Data Reduction

Data are assembled on the telemetry channels in such a manner that minimum ground equipment is required during operational phases. Provisions have been made to assure that event monitor signals are not lost in noise bursts or are hard to distinguish through lack of accurate calibration.


OCV
ADAPTER
NOTES
1. THE 14.5 KC CRYSTAL SCO IS USED FOR TAPE SPEED COMPENSATION DELTA 3P MODE ONLY.
2. TRANSFER SWITCH SHOWN IN SET MODE.
3. RH PREAMP IS CONNECTED TO BAND 12. 10.5 KC WHENEVER D5/2/12 IS A "1"(1+) THE DUAL MULTIPLEXER WILL BE ON WHENEVER D5/2/12 IS A "0" (1-).
4. BASE 1 AND 11 7.35KC UPON COMMAND
T+ WILL READ DELAY LINE ERASE PROGRAM WORD LINE MONITOR.
T-1+ WILL READ LH PREAMP.
T-1- WILL READ BATTERY CURRENT TOTAL.
GYRO ROLL RATE FINE Δ 2,3P
GYRO PITCH RATE FINE Δ 2,3P
GYRO YAW RATE FINE Δ 2,3P
DATA
90 X 1/8 MULTIPLEXER
DELAY LINE ERASE
PROG WORD LINE
Δ 2
T+
T-
L H PREAMP Δ 3P
BATT. CURRENT Δ 3P
CR. BUSY Δ 2,3P
R H PREAMP Δ 2,3P
DATA
Δ 3P
DATA
30 X 2.5 DUAL MULTIPLEXER
DATA
Δ 2
DATA
30 X 5 DUAL MULTIPLEXER
BATT. CURRENT TOTAL Δ 2
BAND 7 — 23KC
BAND 8 — 3.0KC
BAND 9 — 3.9KC
BAND 10 — 5.4KC
BAND 11 — 7.35KC
SCO BASE 1
BAND 6 — 1.7KC
BAND 12 — 10.5KC
BAND 13 — 14.5KC
BAND 14 — 22.0KC
SCO BASE 3
TAPE RECORDER
REC. 7.5 IPS
PB. 30 IPS
TRANSFER SWITCH
RESET
SET
RESET
SET
RS
RT
TRANSMITTER 248.6 MC
TRANSMITTER 258.5 MC
BAND 13 — 14.5KC
BAND 15 — 30.0KC
Δ3
Δ2
BAND 16 — 40.0KC
COMMAND VERIFICATION Δ2
BAND 17 — 52.5KC
AIRBORNE CLOCK Δ2
BAND 18 — 70KC
SCO BASE 2
SCO BASE 6
SRV
LH PREAMP Δ3P
BAND 14 — 22.0KC
R H PREAMP Δ3
BAND 16 — 40.0KC
COMMAND VERIFICATION (BACKUP) Δ3
BAND 17 — 52.5KC
SCO BASE 8
"P" AXIS VALVES Δ3
BAND 10 — 5.4KC
"Q" AXIS VALVES Δ3
BAND 11 — 7.35 KC
"R" AXIS VALVES Δ3
BAND 12 — 10.5KC
DATA
30 X 2.5 DUAL MULTIPLEXER
BAND 13 — 14.5KC
SEPARATION SIGNALS FROM OCV
SRV SYSTEM EVENTS
BAND 8 — 3.0KC
SRV SYSTEM EVENTS
BAND 9 — 3.9KC
BUS MODE AND EVENTS MONITOR
BAND 10 — 5.4KC
RETRO IMPULSE PARA DEPLOY IMPULSE
BAND 12 — 10.5KC
DELTA 4
TRANSMITTER 242.0 MC
SRV TEMP VOLTAGE
SEPARATION SENSOR
TO OCV

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3.3.2.2 Performance Requirements

The following are the performance requirements for the Telemetry and Instrumentation Subsystem:

a. The SRV telemetry transmitter shall operate at a frequency of 242.0 mc $\pm$ 0.01% with an output power of 1.5 watts, minimum.

b. The real-time transmitter in the OCV/Adapter shall operate on an assigned frequency of 248.6 mc $\pm$ 0.01%; the playback transmitter shall operate on an assigned frequency of 258.5 mc $\pm$ 0.01%. The output power of each link shall be 5.0 watts minimum into a cavity-backed slot flush-mounted antenna which has a VSWR of 2:1 maximum in a bandwidth of $f_o \pm 1$ mc.

c. The modulation shall be a combination of FM/FM and PAM/FM/FM.

d. For the data recorder, the elapsed time to make one complete cycle of the tape shall be four minutes $\pm$ 12.5% at a nominal speed of 30 ips when in the Playback mode. The read-in to read-out time ration shall be 4 $\pm$ 5%, providing 16 minutes of data storage capability at a nominal speed of 7.5 ips. The 14-kc channel provides data for tape speed compensation. The recorder shall be on in the "record" mode during the powered flight portion of the flight, i.e., from Atlas ignition through OCV/Agena separation.

e. Redundant channels shall be provided for telemetering the Command Accept/Reject signal.

f. The accuracy of the telemetered data (measured from the input of the subcarrier oscillator on the analog channels, or from the inputs of the multiplexers on the commutated channels to the discriminator output on the ground) shall not exceed the following limits expressed in percent of full scale:

1. Real Time: 68% of the time (1 sigma), the errors shall not exceed 5%; 95% of the time (2 sigma) the errors shall not exceed 10%.

2. Playback: 68% of the time (1 sigma) the errors shall not exceed 8%; 95% of the time (2 sigma) the errors shall not exceed 16%.

g. The Telemetry Subsystem shall furnish 5.0 vdc $\pm$ 2% for operating the sensors of all subsystems requiring this input, from a power supply located in the Command Subsystem power controller.

3.3.3 SEPARATION SUBSYSTEM

In addition to the requirements specified herein, the Separation Subsystem requirements are defined in SVS 4475B.

3.3.3.1 Description

The Separation Subsystem performs the following events at the proper time, on command, during the mission for the primary mode.

Eject hatches and fairings.

Initiate firing of explosive nuts on the "V" clamp.

Eject magnetometer and antenna fairings.

Supply Disconnect 1 signal to the SRV.

Initiate Disconnect 2 signal.

Supply Disconnect 3 signal.

Supply Arm signal to the SRV.

Supply Transfer signal to the SRV.

Separate inflight disconnect on the thrust cone.

Separate the SRV from the Adapter.

A more detailed description of each event is as follows:

a. Powered Flight:

   1. Baroswitch: Monitoring switches open at approximately 20,000 feet. Main switches close between 55,000 and 72,000 feet pressure altitude, arming the subsystem.

   2. Separation 1 - Eject Hatches Command: On receipt of Separation 1 command from TT&C, explosive pistons are fired, activating latches and allowing springs to remove the required hatches from the vehicle.

b. Orbital Flight:

   1. Separation 2 - SV/SS-01-B Separation Command: On receipt of command, nominally 45 seconds after orbit injection engine cutoff, the separation controller supplies power to the "V" clamp explosive nuts to separate the OCV from the SS-01-B. Four separation springs then supply the required relative separation velocities. This command also causes the separation auxiliary controller to supply power (after approximately 20 and 50 seconds) to the explosive pistons of the magnetometer and antenna fairings, causing the fairings to be ejected.

2. Separation 3 - Disconnect 1 Command: On receipt of command at approximately T-3 hours (T is defined as time of separation of thrust-cone inflight disconnect connector), the separation controller delivers power to the SRV to prepare the SRV for deorbit. This command also prepares the separation controller for receipt of all subsequent Separation commands.

3. Separation 4 - Disconnect 2 Command: On receipt of command, after Disconnect 1 command, the separation controller delivers power to initiate Disconnect 2. This command also initiates firing of Disconnect 3.

4. Separation 5/6 - Arm Command: On receipt of command, at approximately T-76 seconds, the separation controller shall deliver power to the SRV to arm the SRV recovery system, turn on SRV TLM power, and activate the SRV TLM battery. This command shall also prepare the separation controller for receipt of Separation 7 command.

5. Separation 7 - Transfer Command - On receipt of command, at approximately T-1 second, the separation controller shall deliver power to the SRV to activate the thermal batteries and to transfer the SRV TLM to internal power. This command also causes the Separation Subsystem to initiate the time-delay squibs for thrust-cone inflight disconnect. The squibs fire approximately 1 second later at T-0, separating the plug and receptacle of the connector. This command shall also prepare the separation controller for receipt of Separation 8 command.

6. Separation 8 - SRV/OCV Separation Command: On receipt of command, at approximately T + 1.5 seconds, the separation controller delivers power to the pin-puller squibs. This allows four separation springs to separate the SRV from the OCV.

c. Backup Mode (Orbital Flight Only):

In the event that the vehicle must be switched to the Back-Up Stabilization Subsystem, the following BUSS commands are generated through the BUSS junction box into the separation auxiliary controller and thence to the separation controller. (Note: Separation 1 and 2 commands are transmitted only by the primary command system):

BUSS 1: Operates 1C24 (+) and 1C25 (-).

BUSS 2: Initiates Separation 3.

BUSS 3: Initiates Separation 4.

BUSS 4: Initiates Separation 5/6.

BUSS 5: Initiates Separation 7.

BUSS 6: Initiates Separation 8.

3.3.3.2 Requirements

The requirements for the Separation Subsystem are as follows:

a. Electrical:

1. Power: The subsystem shall operate on an unregulated power source of 28 (+6, -4) vdc steady state.

2. AGE Test Points: AGE test points shall be provided to enable proper checkout during subsystem and system tests. No provisions shall be made which would allow bypassing of the baroswitches when pyrotechnic devices are installed in the subsystem.

b. Mechanical:

1. SV/SS-01-B Separation: Separation of the SV (or OCV) from the SS-01-B shall occur within the following limits under all combinations of weights, center-of-gravity locations, and moments of inertia, as defined in SVS 4379 and SVS 4382:

(a) Relative separation velocity shall be 0.5 to 1.5 feet per second.

(b) The imparted tip-off rate of the SV (or OCV) about any transverse axis with respect to inertial space shall not exceed 0.33 degree per second (3 sigma) per foot per second of separation velocity.

(c) Imparted roll rate shall not exceed 0.5 degree per second for either the SV or the SS-01-B under all relative separation velocities.

2. Outer Shield Ejection:

(a) The disturbing impulse applied to the vehicle, as a result of outer shield ejection, shall not exceed 5.0 pound-seconds and shall be applied radially at approximately Station 105 and perpendicular to the pitch axis.

(b) Outer shield ejection shall occur during coast phase of vehicle travel when no acceleration is taking place.

(c) The minimum ejection velocity shall be 2 feet per second.

3. SRV/OCV Separation:

Separation of the SRV from the Adapter shall occur with the following limitations:

(a) Separation velocity shall be 1.7 $\pm$ 0.2 feet per second.

(b) Tip-off rate shall be no greater than 1 degree per second about pitch and yaw axes, and no greater than 6 degrees per second about roll axis.

c. Environmental Criteria: The external and internal environmental requirements are defined in SVS 4379.

d. Initiation and Sequencing of Events: Separation events are initiated upon command from the Command Subsystem, which sequences and times the commands. The subsystem shall have lockout features to prevent certain separation events from occurring in an improper sequence.

e. Safety: A mechanical lockout device shall prevent initiation of all pyrotechnic devices below a pressure altitude of 50,000 feet.

f. Monitoring:

1. Continuity Loop: The subsystem shall have continuity loop which will enable a check at a single point to indicate that all pyrotechnics are connected, that all baroswitch elements are in safe position, and that all relays are in proper position.

2. Telemetry: The subsystem shall supply telemetry voltage levels to indicate occurrence of events during the mission. Voltages shall be limited to 5.0 volts. All telemetry levels shall be continuous, step voltages.

3.3.4 ENVIRONMENTAL CONTROL SUBSYSTEM

In addition to the criteria listed herein, the requirements for the Environmental Control Subsystem are defined in SVS 4490A.

3.3.4.1 Description

This subsystem utilizes a passive temperature control system. This system consists of the following:

a. A re-entry heat shield; external coatings of the required absorptivity/emissivity ratio on the Satellite Vehicle.

b. Internal coatings of the required emissivity on the components and the structure.

c. Super-insulation blankets (aluminized mylar) in the RV and OCV.

d. Capacitive heat absorption.

e. Strip heaters (as required) on components or the structure in all sections of the vehicle.

f. Thermostats (as required) on components or the structure.

g. Internal heaters in the recovery battery, RAGS, BUSS freon tank regulator, and TARS components.

h. A proportioning control system in the OCV.

Power from the main batteries (28-volt dc, nominal) is supplied to the heaters in the Satellite Vehicle. Two thermostats (in series parallel) set at the required temperature control level, and one thermostat in series (normally closed) set at a high temperature limit, are used to switch the power on and off. Heaters (both ac and dc) are used on the Stabilization Subsystem pressure tanks for ground heating prior to launch. The dc heaters maintain the on-orbit temperatures of the Stabilization Subsystem pressure tanks.

3.3.4.2 Requirements

The passive control, when used in conjunction with compatible powered flight, orbital, and re-entry parameters as well as component duty cycles, is required to maintain all on-board equipment items within their specified temperature limits with beta angle restricted to -38, +43 degrees. The design criteria are outlined in SVS 4379 and SVS 4490. See Table 3-3 for a detailed listing of components, the temperature control of which is assisted by electrical heaters.

Table 3-3. Component Heater Requirements

Heated Component or Area	Nominal Heater Size at 28 V (watts)	Nominal Thermostat Activation °F	Overload Thermostat Setting °F
SRV			
Capsule	32.4	67 ± 3	--
Recovery battery	32.4	57 ± 3	--
Thrust Cone	16.2	57 ± 3	--
Adapter			
Fwd rack, Quad II (recorder)	9.0	4 ± 3	20 ± 5
Fwd rack, Quad III (recorder)	9.0	4 ± 3	20 ± 5
Aft rack, power controller	8.5	4 ± 3	20 ± 5
Aft rack, PPD	8.5	4 ± 3	20 ± 5
Torque box, Quad III, RF xmtr	18.8	4 ± 3	20 ± 5
Adapter structure	67	67 ± 3	--
PIG	20	67 ± 3	110 ± 5
Forward OCV			
Heater zones 1-4, 8-11	83	70.2 ± 0.2	82 max thermostat 59 min thermostat
Mid OCV			
Primary battery 1	13.7	33 ± 3	72 ± 3
2	13.7	33 ± 3	72 ± 3
3	13.7	33 ± 3	72 ± 3
4	13.7	33 ± 3	72 ± 3
5	13.7	33 ± 3	72 ± 3
6	13.7	33 ± 3	72 ± 3
7	13.7	33 ± 3	72 ± 3
8	13.7	33 ± 3	72 ± 3
RAGS	13.6	165 ± 2.5	152 ± 3 (on block)
Fuel Tank	9.2	50 ± 3	110 ± 5
Oxidizer tank	9.2	50 ± 3	110 ± 5
Nitrogen tank	13.7	33 ± 3	110 ± 5
Pneumatic tray	7.4	33 ± 3	110 ± 5
BUSS Freon tank regulator	16.0	45 ± 5 ON 75 ± 5 OFF	--
BUSS Back-up/Sep Battery	20.0	55 ± 5	80 ± 5
Oxidizer Line	6.0	50 ± 3	
Fuel Line	6.0	50 ± 3	
Aft OCV			
TARS	51.0	165 ± 2.5	--
Cold gas tank, Quad I	20.1	110 ± 5	--
Cold gas tank, Quad IV	20.1	110 ± 5	--
Cold gas line, Quad II	10.1	33 ± 3	110 ± 5
Cold gas line, Quad III	10.1	33 ± 3	110 ± 5
Rocket nozzle solenoids, Quad I	5.5	33 ± 3	110 ± 5
Rocket nozzle solenoids, Quad IV	5.5	33 ± 3	110 ± 5

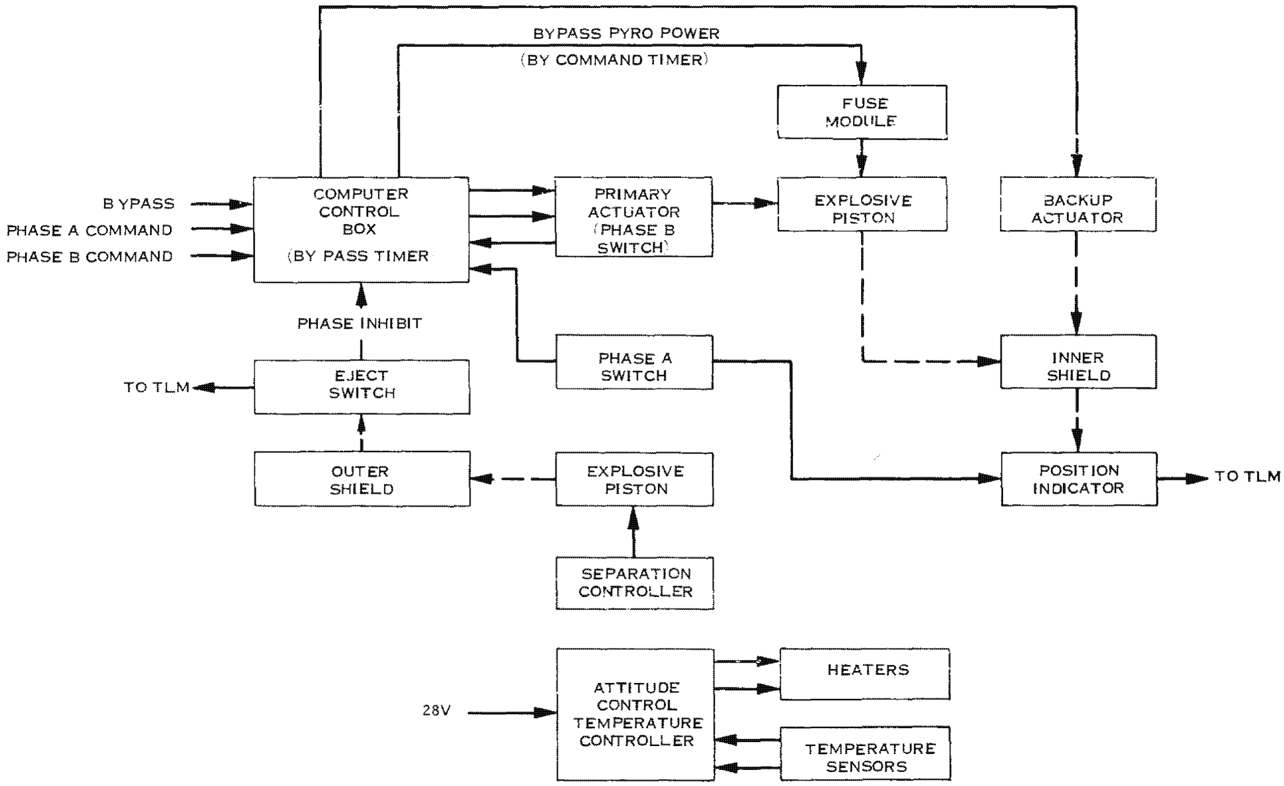

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FIGURE 3-13. ENVIRONMENTAL CONTROL SUBSYSTEM

3.3.5 ELECTRICAL POWER AND SIGNAL DISTRIBUTION SUBSYSTEM

3.3.5.1 Description

The Electrical Power and Signal Distribution (EP & SD) subsystem consists of two subsystems (Power and Harness) which are described separately below and which are defined in SVS 5288 and SVS 5289.

3.3.5.1.1 Power

The Power Subsystem provides all primary power (unregulated) used in the OCV, with a minor amount supplied to the SRV, during final prelaunch operation, and from launch-to-mission termination. The Power Subsystem also provides certain conditioned power such as to the BUSS Subsystem (maximum-voltage limited). Provisions are made to switch from ground power (supplied by AGE) to internal power upon command via AGE.

Primary power is provided from eight (maximum) silver-zinc nonrechargeable batteries having a high efficiency of chemical-to-electrical transfer and high reliability. Secondary (BUSS/Separation backup) power is provided by a single silver-zinc battery of 35 A.H. nominal capacity. A central power control and distribution center is also provided. Certain auxiliary devices are provided such as an ampere-hour counter and a BUSS step-down module.

The Power Subsystem is protected from certain in-flight malfunctions such as battery cell shorting and battery over-pressurization. Protection against cell shorting is accomplished by power transistors configured for diode isolation of the individual batteries and is incorporated in the LLCB. The Power Subsystem also has provisions, for monitoring the health of the Subsystem during flight (see Figure 3-14 for a block diagram of the Power Subsystem). Protection against battery over-pressurization is attained by providing individual battery vents to the outboard side of the vehicle.

3.3.5.1.2 Harness

The Harness Subsystem provides all interconnections between all "black-boxes" contained within the OCV except for certain "pre-tuned" cables, such as from transmitters to antennas, and leads pigtailed-off components, such as temperature sensors, heaters, and the TARS platform. The Harness Subsystem provides connectors so that the several sections of the OCV can be physically mated and demated. The Harness Subsystem also provides the electrical connection to the GFE. Further, the Harness Subsystem provides a means to connect (and disconnect in-flight) to the SRV and to AGE (through an umbilical connector) and an in-flight disconnect for separating the OCV from the booster. The Harness Subsystem furnishes certain switching devices to switch in "flight" signals to be used by AGE while on the ground and back to normal configuration.

The Harness Subsystem minimizes voltage drops to the maximum extent feasible, reduces EMI radiation and susceptibility to the maximum extent feasible (as outlined in DIN 62SD4562), minimizes possible handling malfunctions, and is highly reliable in flight. (See Figure 3-15 for a block diagram of the Harness Subsystem.)

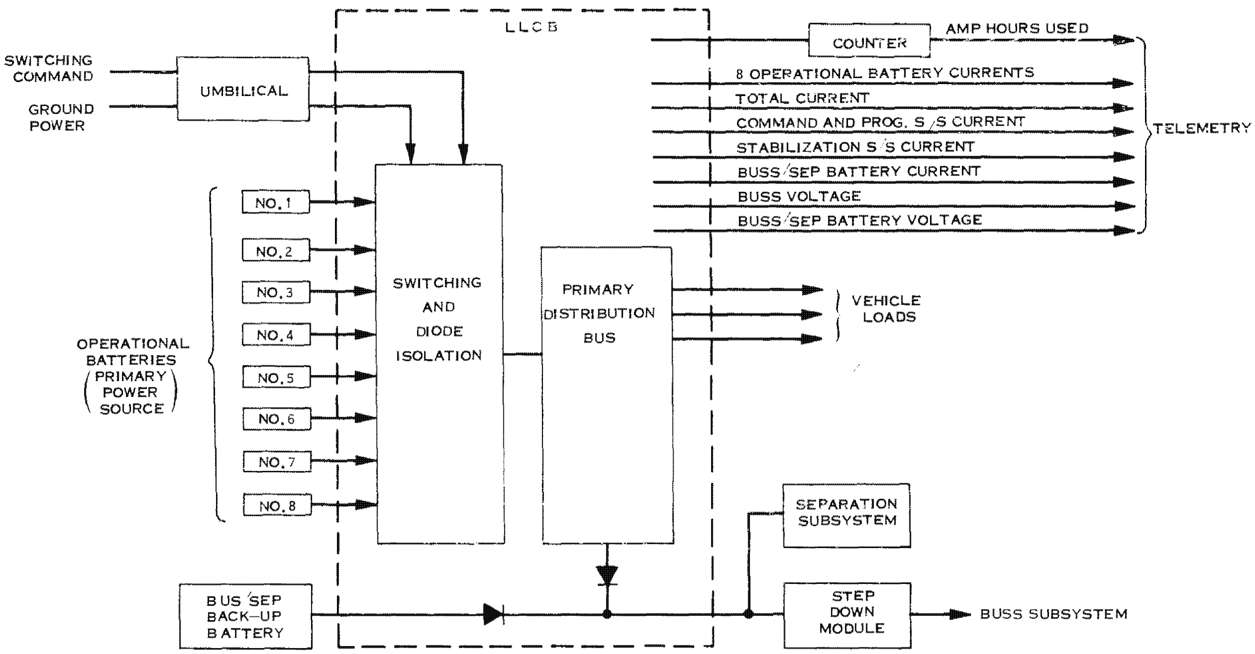

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FIGURE 3-14. POWER SUBSYSTEM BLOCK DIAGRAM

Harness for interconnecting commands from the Command Decoder and/or Command Decoder Relay Box shall comply with the Command Function Allocations defined by the System Acceptance Specification.

Harness for interconnecting telemetry data signals from the various subsystems and sensors shall comply with the Telemetry Allocations defined in the System Acceptance Specification.

3.3.5.2 Requirements

3.3.5.2.1 Power Subsystem Requirements

a. Primary Power:

1. Voltage:

(a) Steady State: The voltage at the primary distribution bus shall not be more than +33.5 vdc nor less than +27.0 vdc.

(b) Transient Conditions: The voltage at the primary distribution bus shall not drop below the steady-state value for a period exceeding 100 milliseconds. The minimum voltage shall be +26.0 volts during these transients.

2. Current:

(a) Steady-State: The total current supplied shall be within the range of 4.0 to 25.0 amperes.

(b) Transient Conditions: The total current supplied shall be any value not exceeding 50 amperes for any time not exceeding 100 milliseconds.

3. Capacity: The total power supplied shall be a minimum of 2550 ampere-hours, including power used from the primary power source during prelaunch operations. Total power allotments to each subsystem, based on a 168-hour mission and 28-vdc nominal input voltage, are:

Subsystem	Ampere-Hours
Stabilization	1260
TT&C	406
Environmental Control	685
Separation	Negligible

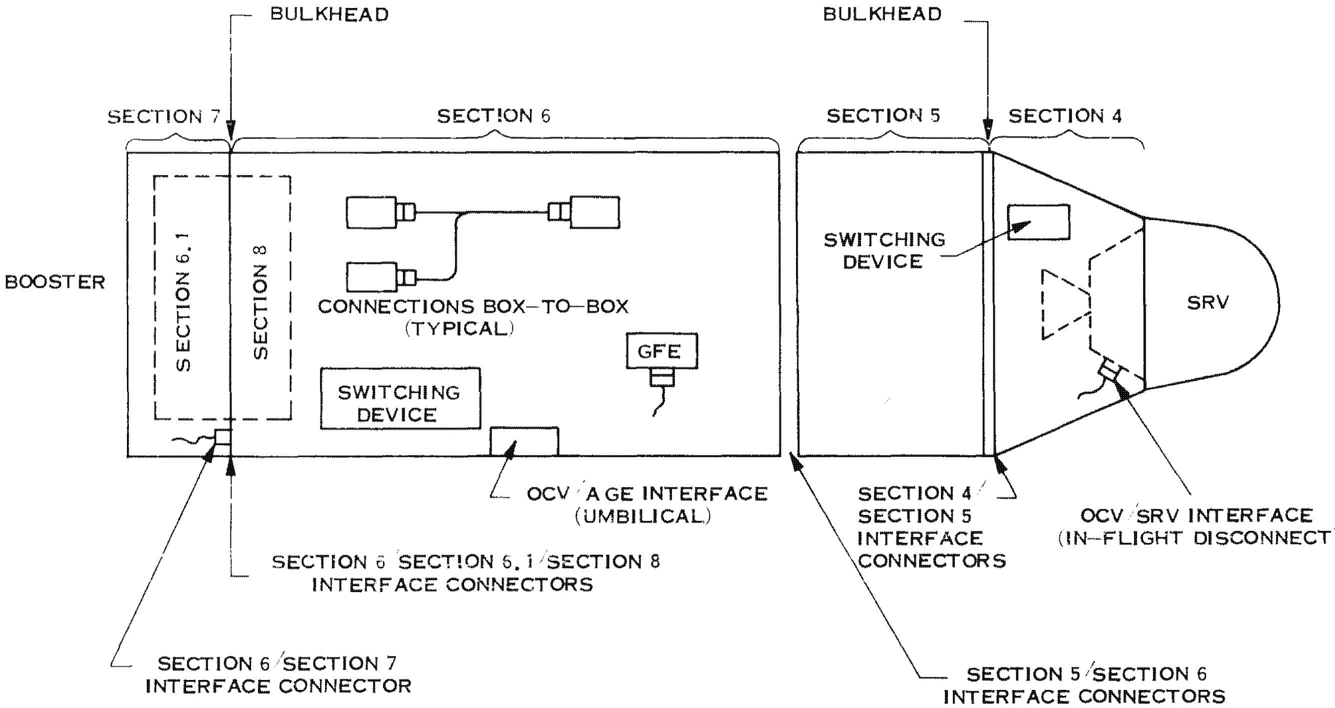

FIGURE 3-15. HARNESS SUBSYSTEM

Subsystem	Ampere-Hours
Orbit Adjust	23
BUSS	12
Elect Power and Distribution	42
GFE	98

4. Protection:

(a) Electrical: Protection against batteries having shorted cells should be provided by "diode" isolation of the individual batteries.

(b) Chemical: Protection shall be provided such that if the internal pressure of a battery is greater than 17 psig maximum gaseous (or possibly liquid) products may be expelled. The expelled products shall be vented through ports on the skin of the vehicle.

(c) Thermal: The battery temperature limits are 30°F to 120°F.

5. Switching:

(a) Ground: Provisions shall be made to simultaneously switch from ground-supplied power (through an umbilical connector) to internally supplied power and back, upon commands supplied via the umbilical connector. The time during which no power is provided to the OCV during the switching period shall not exceed 10 milliseconds.

(b) In-flight: Provisions shall be made to command all batteries to connect to the primary bus upon command from the Command Subsystem.

6. BUSS Power:

(a) Voltage Supplied: Means shall be employed to reduce the primary power bus voltage supplied to the BUSS Subsystem to 29.5 vdc maximum. (31 vdc can be applied to the subsystem in the Stand-by mode.) Means shall also be employed so that the voltage reduction may be switched out upon command from the Command Subsystem while in flight.

(b) Current Supplied: The current supplied shall be 1.8 ampere maximum.

7. Telemetry Provisions: Provisions shall be made to provide the following signals to the Telemetry Subsystem:

(a) Current from each battery:

Range:	0.0 to +10 amperes
Accuracy:	± 0.5 amperes

(b) Total current drawn:

Range:	0 to +50 amperes
Accuracy:	±1.0 amperes

(c) Primary distribution bus voltage:

Range:	+33.0 vdc to +23.0 vdc
Accuracy:	±0.2 vdc

(d) Total ampere-hours consumed:

Range:	0 to 630 ampere-hours (recycles at 640 ampere- hours)
Granularity:	10 ampere-hour steps
Accuracy:	±2% of reading

(e) Battery Temperature:

Range:	0° to 130°F
Accuracy:	±5%

(f) Command and Programmer Load Current:

Range:	0 to 5.0 amperes
Accuracy:	±0.2 amperes

(g) Stabilization Load Current:

Range:	0 to 15 amperes
Accuracy:	±0.6 amperes

b. Secondary Power: (BUSS/Separation Back-Up Battery)

1. Voltage:

Maximum: +32.0 vdc

Minimum: +23.5 vdc

2. Current: (during terminal events) 1.8 amperes maximum (1.0 ampere nominal) with 25 ampere pulses.

3. Capacity: 30 ampere-hours minimum

4. Protection:

(a) Electrical: The BUSS/Separation back-up battery shall be connected to the BUSS/Separation bus via isolating power diodes. The primary bus will also be connected to the BUSS/Separation bus via isolating power diodes.

(b) Chemical: The BUSS/Separation Back-up battery shall be equipped with a relief valve such that, should the battery internal pressure increase to 17 psig maximum, gaseous (or possibly liquid) products may be expelled.

5. Switching:

(a) Ground: Provisions shall be made to disconnect the BUSS/Separation Back-up battery from the BUSS/Separation line upon the same command from AGE which disconnects the primary internal power from the primary distribution bus.

(b) In-flight: The BUSS/Separation Battery shall be commanded "on-line" by the same command which commands all primary batteries to connect to the primary bus.

6. Telemetry provisions: Provisions shall be made to provide the following signals to the Telemetry Subsystem.

(a) BUSS/Separation Back-up Battery Voltage

Range: 21 to 33 vdc

Accuracy: ± 0.5 vdc

(b) BUSS/Separation Back-up Battery Current

Range: 0 to 2.0 amperes

Accuracy: ±0.1 amperes

3.3.5.2.2 Harness Subsystem Requirements

Interfacing provisions shall be made such that the vehicle can be physically mated and demated electrically via electrical connectors, and so that it can be connected to the SRV and to AGE as follows:

a. SRV: Connection to the SRV shall be such as to made with a 55-pin connector, Bendix type PC07H-22-55P, and provisions shall be made for being disconnected therefrom in-flight by explosive means, electrically actuated upon command. The connector shall mate to the SRV at Station 46.45, 230 degrees. Means shall be provided in the primary structure to prevent the disconnected connector from damaging other components.

b. AGE: A 114-pin connector, General Electric Drawing No. 825D609G1, shall be provided at Station 207, 100 degrees, to connect to AGE via the umbilical connector. This connector shall provide all the required hardwire connections to the SV during the final prelaunch operations prior to liftoff. The withdrawal force shall be 140 pounds maximum, at 45 degrees to normal, with mechanical assist. Mechanical assist is built-in, and for this condition the withdrawal force is 20 pounds maximum.

c. Section 4/Section 5: Connectors shall be provided such that Section 4 may be physically mated and demated from Section 5. All electrical connection between the two sections shall be through these connectors.

d. Section 5/Section 6: Connectors shall be provided such that Section 5 may be physically mated and demated from Section 6. All electrical connection between the two sections shall be through these connectors.

e. Section 6/Section 6.1/Section 8: Provisions in the structure shall be made such that the bulkhead at Station 216 may be physically mated and demated from Section 6. The bulkhead contains components both aft of the bulkhead (Section 6.1) and forward of the bulkhead (Section 8). Connectors shall be provided such that the bulkhead may be physically demated from Section 6. All electrical connection between Section 6 and Sections 6.1 and 8 shall be through these connectors.

f. Section 6/Section 7: Section 7 remains with the booster after separation. A 12-pin connector, General Electric Drawing No. 102B7822, on the aft side of the bulkhead at Station 216, 123 degrees, shall disconnect from its mating connector mounted to the bulkhead upon a pull of 25 pounds maximum provided by the separation springs. All electrical connection between Section 6 and Section 7 shall be through this connector.

3.3.5.2.2.1 Voltage Drop

Specifications for allowable voltage drops are as follows:

a. Steady-State Power: For continuously operating loads and intermittent loads having transients not exceeding 4.0 amperes, the line drop from the primary distribution bus to the using subsystem or component connector shall not exceed 1.0 vdc.

b. Transient Load Power: For intermittent loads in excess of 4.0 amperes, the line drop from the primary distribution bus to the using subsystem or component connector shall not exceed 4.0 vdc.

c. Signal Leads: Signal-lead voltage drop shall not exceed 0.1 vdc.

3.3.5.2.2.2 Handling Provisions

Means shall be employed to reduce wire breakage, both on the ground and in flight, as follows:

a. All connectors will have some means of strain relief. This may be either potting or mechanical clamps attached to a connector. Coaxial connectors will use the shield as a mechanical clamp and shall be securely fastened. Potting may be employed where feasible.

b. To the extent possible, cables will enter boxes at right angles. However, "straight in" connectors shall be allowable where necessary.

c. Wires in a cable will be twisted together from within approximately 3 inches from a connector, and shall extent approximately for 24 inches (as feasible) or to a cable breakout.

d. Cable identification tags, first cable clamp, and other restrictive devices attached to a harness will be loose to allow a cable to bend at least 6 inches from the connector to prevent strain on wires at the connector.

3.3.5.2.2.3 Switching Devices

Provisions shall be made in the harness Subsystem to switch certain signals, normally telemetered in-flight, to hardwire connection through the umbilical connector. These shall include such signals as cold gas temperature and pressure, and certain SRV and Section 4 signals.

3.3.5.2.2.4 EMI Suppression

In general, power leads and their returns are twisted pairs; pyro leads are shielded, twisted pairs with shields grounded at the pyro end of the cable; and A-C power leads are shielded, twisted pairs or shielded, twisted triplets, etc.

3.3.6 STABILIZATION SUBSYSTEM

3.3.6.1 Description (See Figure 3-16)

The Stabilization Subsystem comprises the following three major subsystems. (The subsystem is fully defined in SVS 5009B.)

a. Position-sensing subsystem.

b. Rate-sensing subsystem.

c. Actuation and control subsystem.

The primary function of the Stabilization Subsystem is to maintain a fixed relationship between the satellite reference axis and the earth, in the vertical and azimuth reference planes. The vertical reference is determined by two IR scanners mounted on a two-gimbal, three-axis reference platform. This gyro-stabilized platform serves as base motion isolation for the scanner loop. The sensors detect the platform motions in pitch and roll, then generate appropriate control signals to reorient the platform (hence the vehicle) in terms of the local vertical.

The IR horizon sensor system (HSS) when provided as Government Furnished Equipment (GFE) shall conform to SSVAR-5, 6, 7 & 8 regarding interface requirements. The requirements as specified herein are necessary to system performance, but do not represent the total description of that system.

In the Fly Forward mode, yaw stabilization is obtained by gyrocompassing whereby the roll and yaw gyro torquers are connected in series, coupling roll error signals from the HSS directly to the yaw gyro. A yaw position causes a position error in roll as a result of the roll gyro input axis coupling into the orbital rate vector. A roll position error signal from the horizon sensor system then results, which corrects both the yaw error and the roll error by torquing both gyros towards a null position at rates proportional to the magnitude of the roll error. Polarities are so arranged in the Fly Forward (positive gyrocompassing) mode that the positive roll axis lies along the positive vehicle velocity vector. (See Figure 3-17 for gyrocompassing time.) In addition, the pitch gyro torques with a fixed torquing rate of 0.068 ± 2% degree per second to eliminate stand-off caused by sensing of orbital rate of pitch gyro.

A Yaw Around maneuver is implemented by disconnecting the connection between the roll and the yaw gyro torquers and biasing the yaw gyro torquer with a fixed torquing rate of 0.4 ± 2% degree per second for a measured period of time. The roll gyro is connected directly to its torquer amplifier to complete the roll continuity. The yaw bias is programmed from the Command Decoder for 450 seconds.

The Fly Reverse mode shall be used immediately following a Yaw Around command. Implementation involves reversing the yaw-roll torque amplifier connections in addition to the polarity reversal of 0.068 ± 2% degree per second (orbital bias) to the pitch gyro.

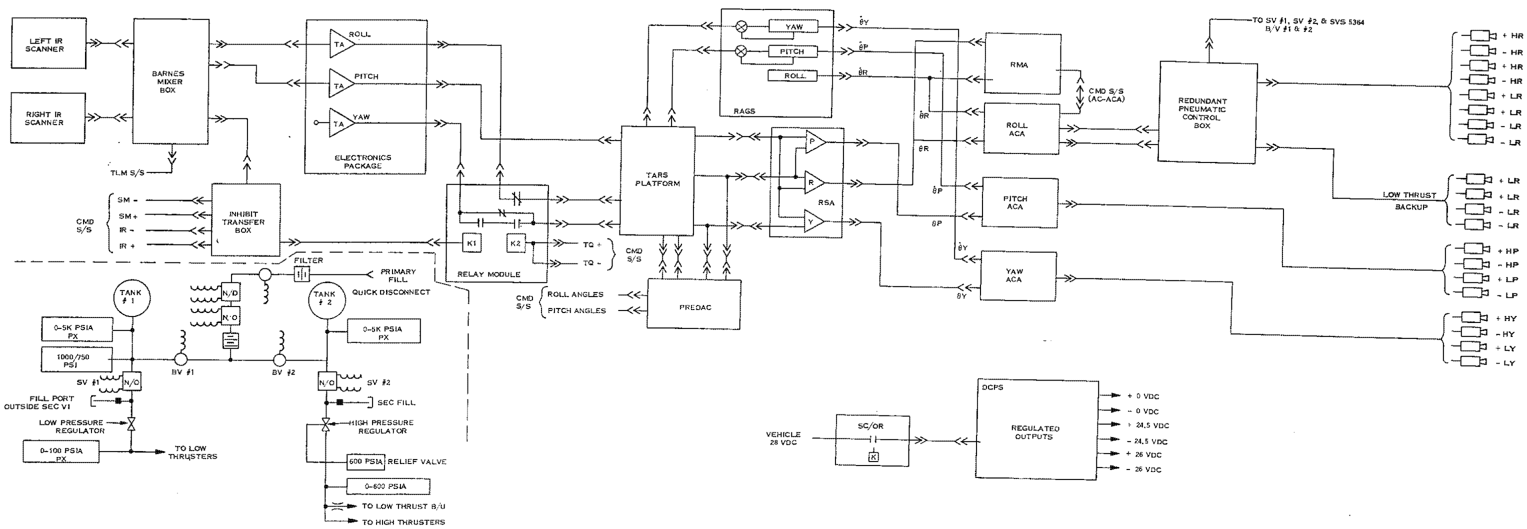

FIGURE 3-16. STABILIZATION SUBSYSTEM

Approved for Release: 2024/01/30 C05098946

The relays which perform the switching and mode selection are located in the TARS electronics package (E/P). These relays are actuated by commands from the Command Subsystem.

The IR horizon sensor system (IRHSS) shall contain circuitry which causes the roll and pitch outputs for control and telemetry to be within the following limits and the inhibit modes, and shall meet the requirements as defined in the Barnes system performance requirements, 2027-S-01 specifically.

a. The unit shall be in the Inhibit mode whenever the peak-to-peak preamplifier voltage of the IRHSS is less than 0.17 volt.

b. The unit shall not be in the Inhibit mode whenever the peak-to-peak IRHSS preamplifier voltage is greater than 0.47 volt at an instrument temperature of 50°F to 140°F, and 0.55 volt at an instrument temperature of 0°F to 50°F (except for sun inhibit).

c. The unit shall be in the Inhibit mode whenever the sun is in the field of view of either scanner.

d. With either or both scanner heads inhibited, the roll control output shall be 0 ± 3 vdc and the roll telemetry output shall be 2.5 ± 0.2 vdc.

e. With both scanner heads inhibited, the pitch control output shall be 0 ± 3 vdc and the pitch telemetry output shall be 2.5 ± 0.2 vdc.

f. With one scanner head inhibited, the accuracy of the pitch control output shall not change by more than 0.2 degree. The accuracy of the pitch telemetry output shall not change by more than 0.4 degree.

g. Whenever the IRHSS preamplifier signal is less than 0.5 volt peak-to-peak, the hard edge accuracy requirements of SVS 5141 are relaxed to twice the specification limit. The telemetry offset is relaxed to 2.5 ± 0.2 vdc.

h. While in the Inhibit mode, the HSS shall generate an Inhibit Alarm signal of from 23.5 to 26.5 vdc.

i. In normal control mode, the HSS supplies the control roll and control pitch at a gradient of 10 ± 2 vdc/degree.

j. The linear range of control roll and control pitch is ± 1 degree, or ± 10 vdc, whichever is greater.

Upon command (by the IRHSS) of pitch and/or roll inhibit, the inhibit transfer box shall ground the compensator inputs (control pitch and control roll) and shall generate a command to the relay module to open signal leads of the roll and yaw gyro torque generators. The Attitude Control Subsystem will then be operating inertially in roll and yaw, while the pitch channel will be supplied with the normal orbital bias of 0.068 ± 5% degree per second. This operating condition shall be maintained until the IRHSS removes the Inhibit condition and supplies a local vertical reference to the TARS.

To enhance the probability of regaining the horizon during a HSS inhibit, a Search On mode can be commanded in real time; this command will over-ride the Inhibit mode by interrupting the Inhibit command to the inhibit transfer box and will cause the TARS to use the IRHSS control roll and pitch outputs as the actual vertical reference. Thus the TARS, and subsequently the vehicle, will rotate slowly about the inhibited axis (pitch and/or roll and yaw) at a rate dependent upon the IRHSS control outputs normally provided during the Inhibit mode.

If the IRHSS re-acquires the local vertical, the Attitude Control Subsystem will maintain normal operation. During normal IRHSS operation (i.e., no Inhibit) the Search On mode shall have no effect upon the operation of the Attitude Control Subsystem. However, Search On should only be used as a last resort to regain IR lock. The Stabilization Subsystem shall have the capability to torque the vehicle about the yaw axis in a positive direction even when the IRHSS is in the inhibit mode.

The actuation subsystem generates vehicle-restoring torque through the mass expulsion technique. The on/off action of the valves is governed by the Attitude Control Subsystem amplifiers, which independently implement a phase plane for each vehicle axis. The Attitude Control Subsystem is also capable of accepting external commands during the orbital phase of flight and effecting vehicle maneuvers about the pitch, yaw, and roll axes.

3.3.6.2 Requirements

For overall modes of operation, the attitude control requirements include all environments normally seen by the satellite vehicle. The requirements for the modes of operation are as follows.

3.3.6.2.1 Powered Flight Mode

a. Vehicle Angular Rates: Less than 2 degrees per second.

b. Vehicle Angular Accelerations: Less than 0.2 degree/second per second.

c. Vehicle Linear Accelerations: Less than 12 g.

d. Pitch and Roll Channels:

1. Dynamic accuracy of the caging servo shall be $\pm$ 2 degrees for vehicle turning rates not exceeding 0.17 degree per second, and $\pm$ 13 degrees for vehicle turning rates not exceeding 1.2 degrees per second.

2. Static accuracy of the caging servo shall be $\pm$ 1 degree.

3. Power input to caging servo shall be a voltage of 800 cps, whose RMS amplitude varies with gimbal angle and command angle as follows:

$$\text{Amplitude} = 26 \sin (\text{gimbal angle minus command angle})$$

e. Yaw Channels:

1. Vehicle parameters for yaw are the same as those specified in preceding items a, b, and c.

2. Dynamic accuracy of the caging servo shall be such that an input rate of 1.2 degrees per second does not cause the gyro gimbal deflection to exceed 1.75 degrees.

3.3.6.2.2 Acquisition Mode

The Stabilization Subsystem will provide control if the OCV is injected within the following limits of position error and vehicle rates:

Pitch angular error relative to local vertical	$\pm$ 7.5 deg max
Roll angular error relative to local vertical	$\pm$ 2.0 deg max
Yaw angular error relative to the velocity vector	$\pm$ 2.0 deg max
Pitch angular rate	$\pm$ 1.0 deg/sec max
Roll angular rate	$\pm$ 1.0 deg/sec max
Yaw angular rate	$\pm$ 1.0 deg/sec max

3.3.6.2.3 Coarse Limit Cycle

a. Pitch/Roll/Yaw Channel Position Intercepts: $\pm$ 1.5 degrees $\pm$ 0.346 degree.

b. Pitch/Roll/Yaw Channel Rate Intercepts: $\pm$ 0.682 $\pm$ 0.22 degree per second.

c. Deadband Equation: Deadband limits are determined as follows:

$$+\theta_{DB} = \theta + K\dot{\theta}, \quad \text{(No derived rate)}$$

$$\theta_{DB} = \pm 1.5$$

$$1/K = 0.455 \pm 0.073 \text{ deg/sec per degree}$$

d. Refer to Figure 3-18 for coarse limit cycle switching lines.

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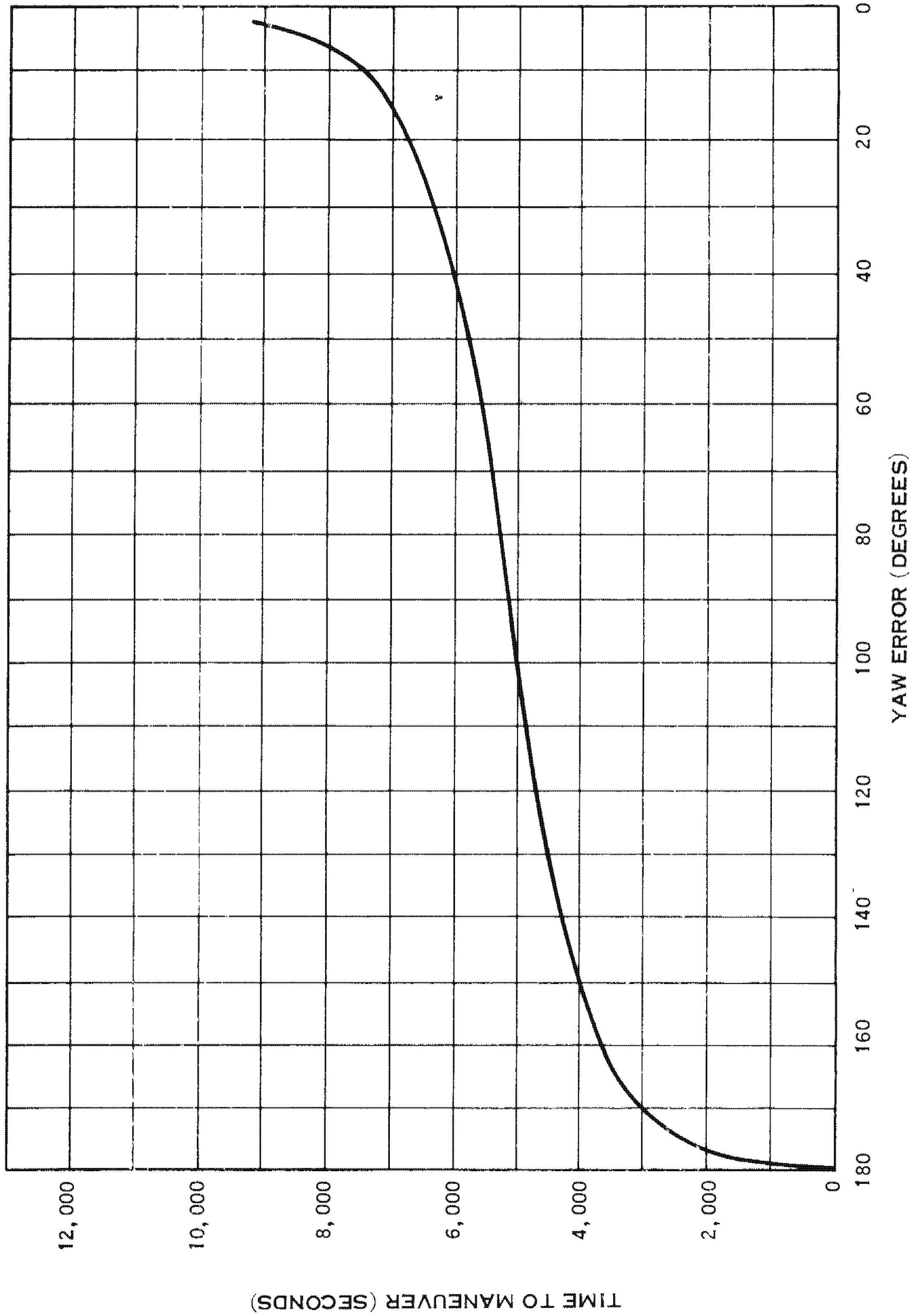

Figure 3-17. Yaw Settling Time vs Error

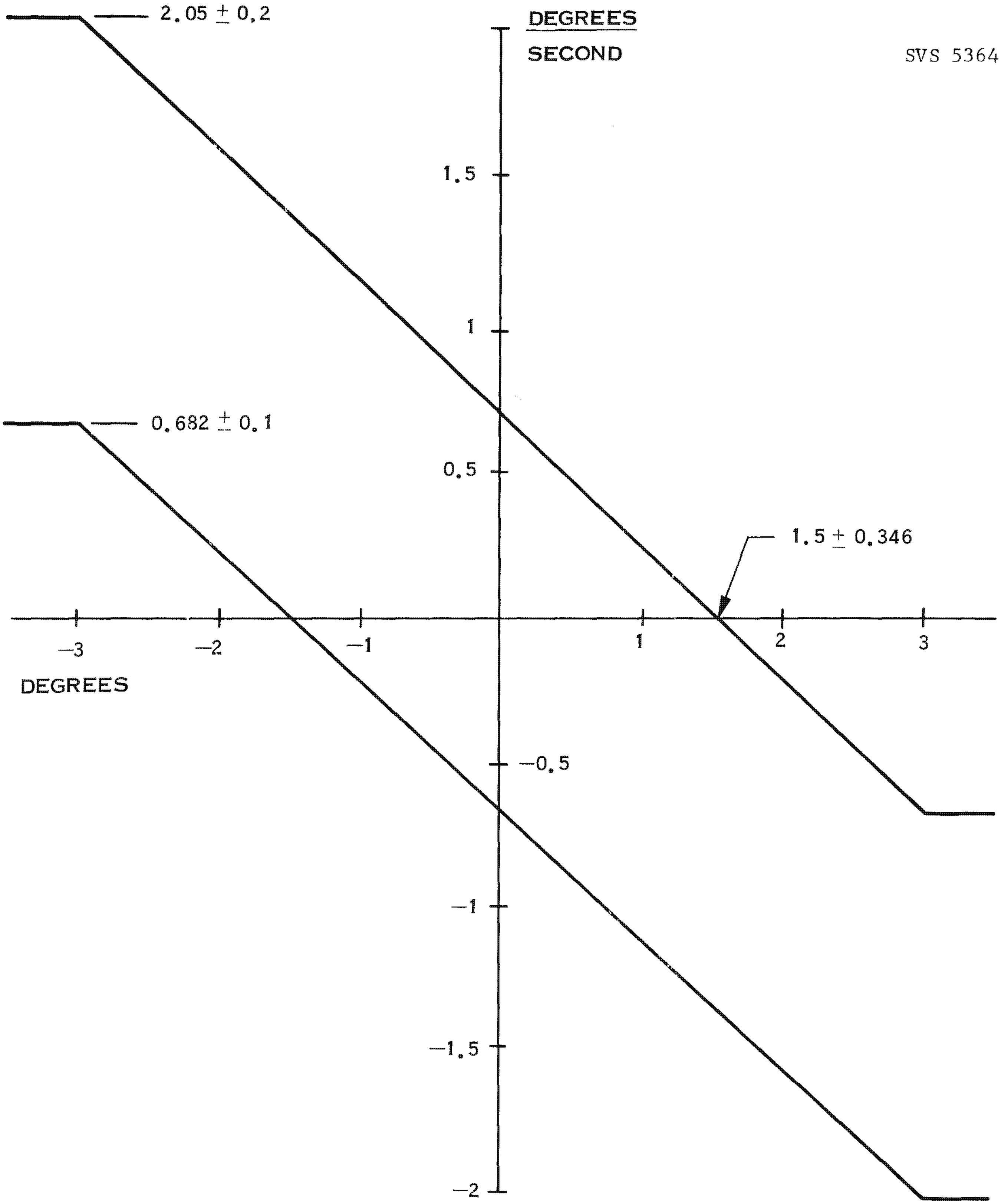

Figure 3-18. Switching Lines, Coarse Limit Cycle
(RAGS In, No Derived Rate)

e. High Maneuvering:

1. Limits of vehicle position: ±45 degree roll.

2. Limits of vehicle rates: ±3 degrees per second.

3. Resolution of roll angle particle: 0.709 degree.

4. Command equation for roll angles: = 0.709 (64-N).*

5. Self-disabling upon maneuver completion.

6. High thrust level actuation.

7. Refer to Figure 3-19 for high maneuvering switching line intercepts.

8. The maximum roll maneuver settling time shall be 6.0 seconds.

9. When the roll maneuvering amplifier (RMA) is enabled, it implicitly disables the roll attitude control amplifier (ACA) and commands the rate roofs OFF in pitch, yaw, and roll fine limit cycle until the maneuver is completed. Completion of the maneuver disables the RMA.

f. Medium Maneuvering:

1. Limits of vehicle position: ±45 degrees roll.

2. Limit of vehicle rate: ±1.5 degrees per second.

3. Resolution of roll angle particle: 0.709 degree.

4. Command equation for roll angles: = 0.709 (64-N)*.

5. Self-disabling upon maneuver completion.

6. High thrust actuation.

7. Refer to Figure 3-19 for medium maneuvering switching lines intercepts.

8. When the roll maneuvering amplifier (RMA) is enabled, it implicitly disables the roll attitude control amplifier (ACA) and commands the rate roofs OFF in pitch, yaw, and roll fine limit cycle until the maneuver is completed. Completion of the maneuver disables the RMA.

*Note: N = Zero to 127 (decimal equivalent of binary word)

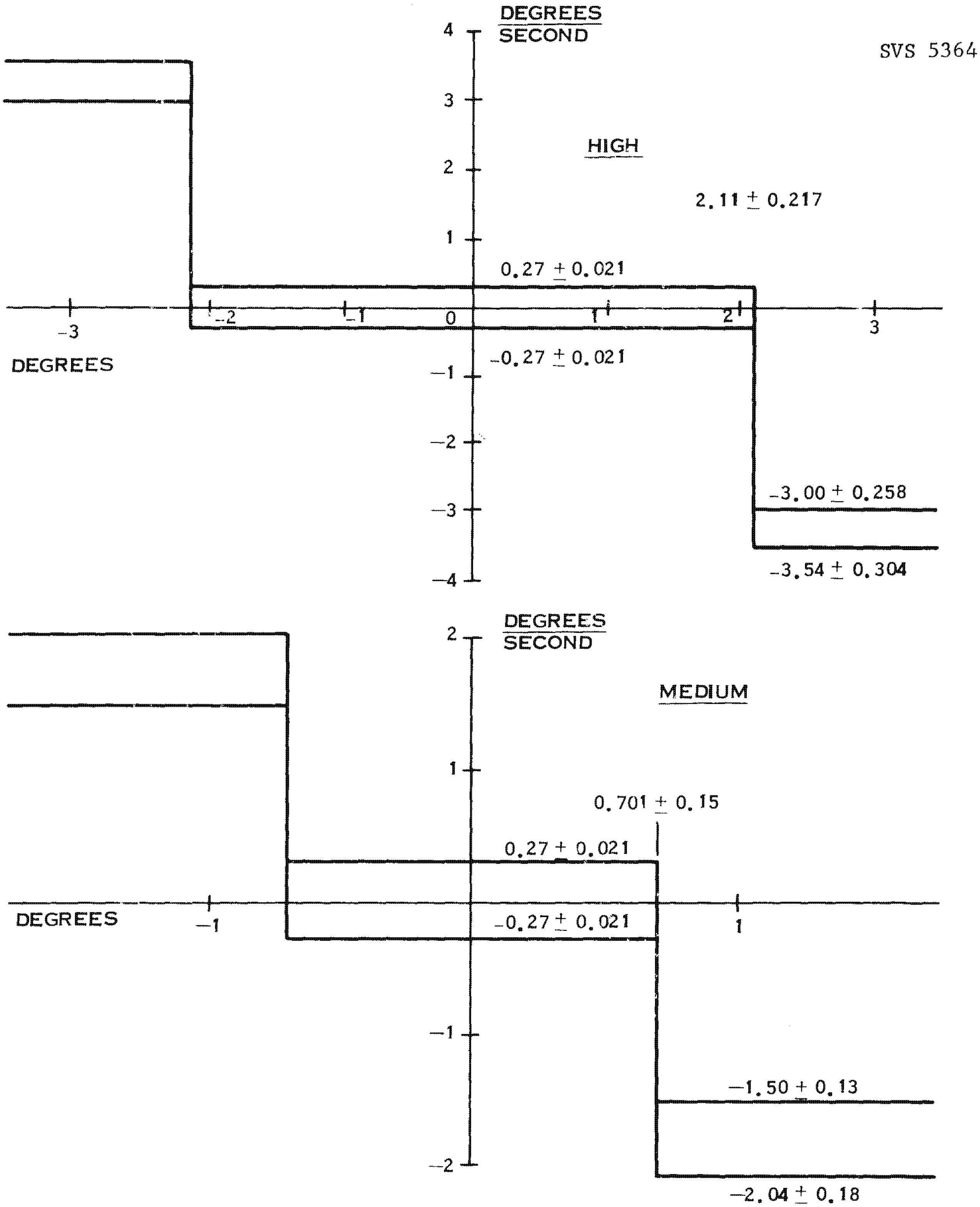

Figure 3-19. Switching Lines, Intercepts
(RAGS In, No Derived Rate)

3.3.6.2.4 Fine Limit Cycle

a. Pitch/Roll/Yaw channel position intercepts: ± 0.3 degree, ± 0.17 degree.

b. Pitch/Roll/Yaw channel rate intercepts: ± 0.1365 ± 0.065 degree per second.

c. Refer to Figure 3-20 for fine limit cycle switching lines.

d. Limit of roll rate: ± 0.25 degree per second minimum.

e. Deadband Equation: $\theta db - \theta + K\dot{\theta}$ (no derived rate), where 1/K = 0.455 ± 0.055 deg/sec per degree.

f. Fine Limit Cycle and Rate Roofs

1. Rate roof - rate intercepts: ± 0.015 ± 0.0069 degree per second.

2. Actuation: Low thrust.

3.3.6.2.5 Orbit Adjust

The Stabilization Subsystem is required to sustain disturbance torques and to maintain the SV heading during orbit-adjust maneuvers. The maximum control torques available are:

Roll:	26 foot-pounds
Pitch:	42 foot-pounds
Yaw:	42 foot-pounds

During this maneuver the roll and yaw will be controlled in their coarse limit cycle. The pitch will be controlled in the fine limit cycle.

3.3.6.2.6 Deboost Capability

For deorbit, the program requires a capability of yawing the vehicle around 180 ± 3 degrees in less than 70 minutes and pitching it down 58.3 degrees in less than 10 minutes. Pitch orbital rate polarity will be reversed according to the direction of flight at the time that "fly reverse" is commanded. The pitch, roll, and yaw will control in coarse deadband.

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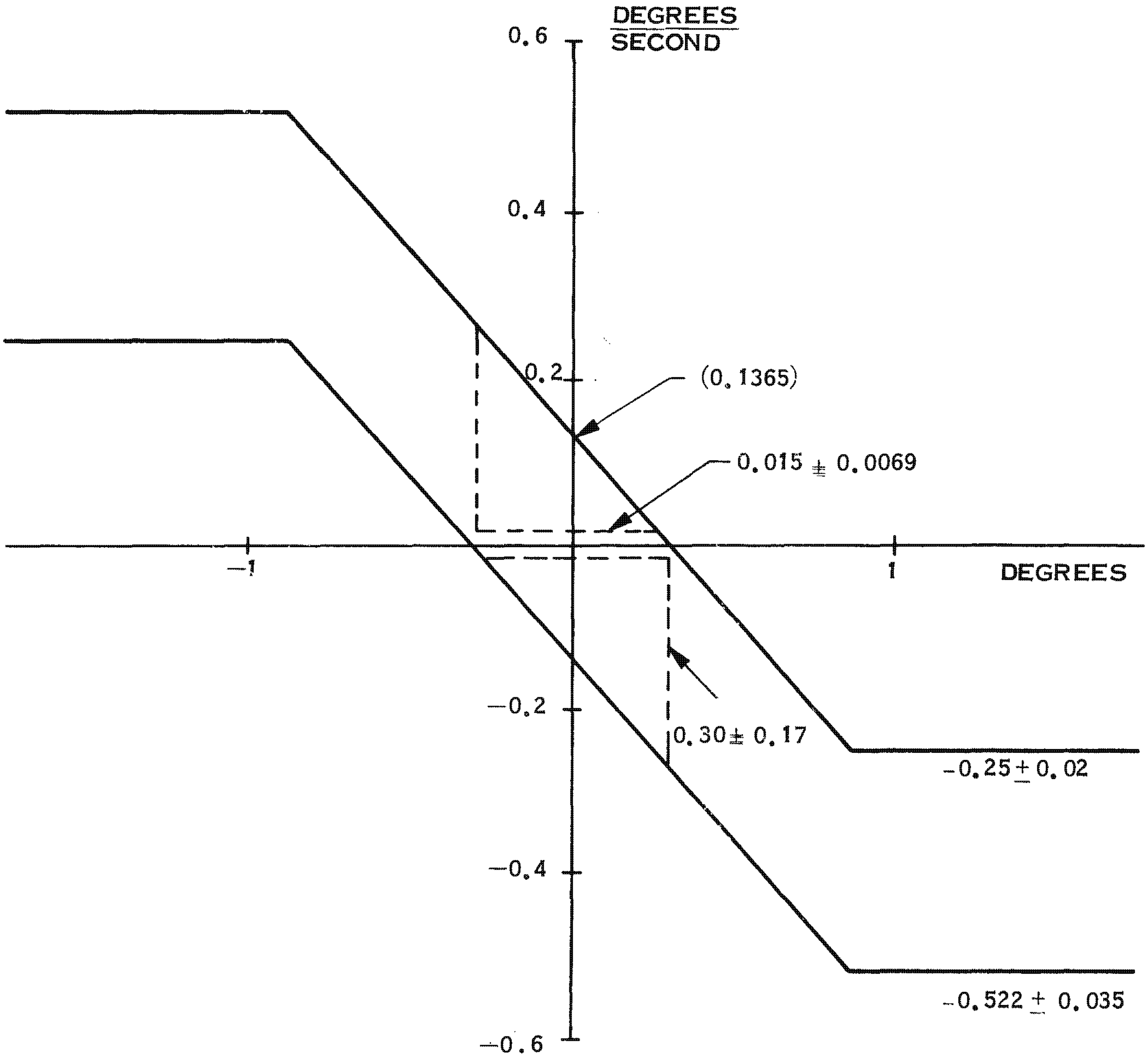

Figure 3-20. Switching Lines, Fine Limit Cycle
(RAGS In, No Derived Rate)

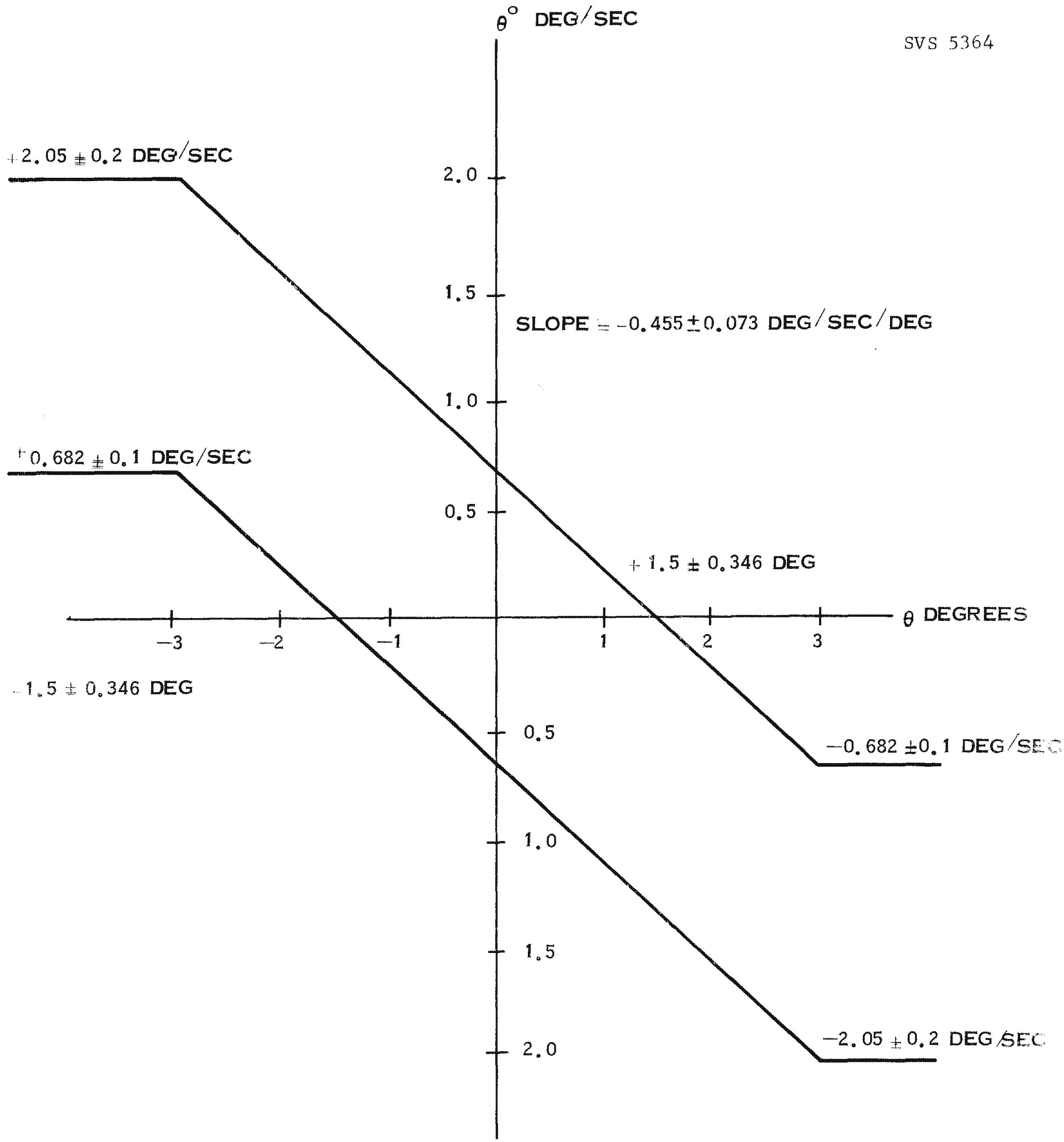

FIGURE 3-21. COARSE LIMIT CYCLE (NORMAL)

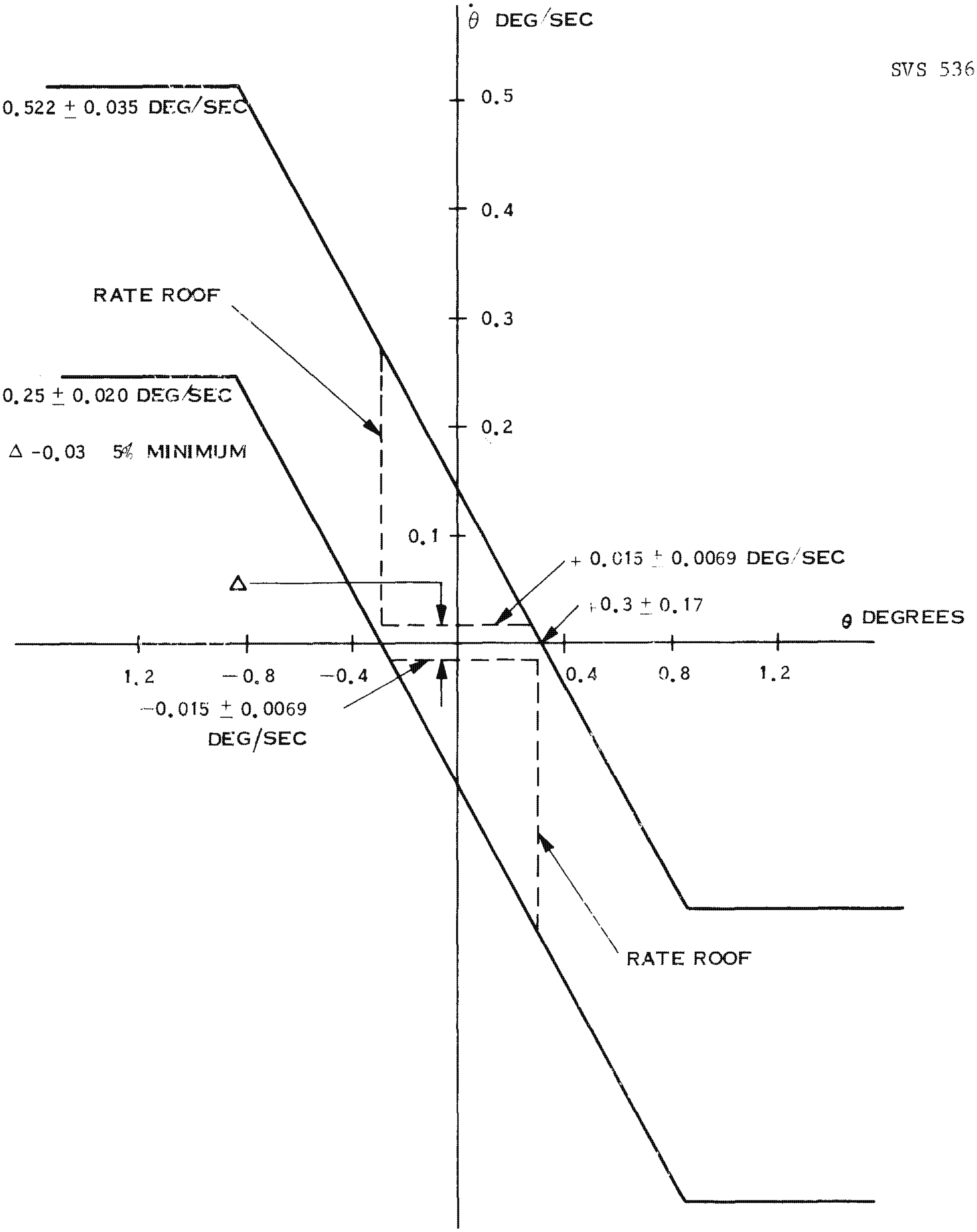

FIGURE 3-22. FINE LIMIT CYCLE (NORMAL)

3.3.6.2.7 TABOO Logic Modes

The following 8 TABOO modes cannot electrically be implemented in flight:

TABOO Mode 1: Roll Fine Limit Cycle High Thrust

TABOO Mode 2: Pitch or Yaw Fine Limit Cycle + Rate Roofs + High Thrust

TABOO Mode 3: Roll Maneuvering Amplifier when commanded to enable, shall inhibit pitch and yaw rate roofs and shall inhibit the roll coarse and fine deadbands.

TABOO Mode 4: Yaw Torque + Yaw Fine Limit Cycle

TABOO Mode 5: Fly Reverse, Pitch Fine Limit Cycle. (This mode is eliminated by operational software constraints only.)

TABOO Mode 6: Pitch Down, Roll Command Not Zero

TABOO Mode 7: IR OFF (by single command)

TABOO Mode 8: Attitude Control Amplifiers Disable (by command)

3.3.6.2.8 Derived Rate

A differentiating network contained within each attitude control amplifier operates on the input position signal. The output of this differentiator is summed with the RAGS rate signal as a redundant rate source. The dynamic range of the position signal is ± 3 degrees; this precludes rate saturation beyond these limits.

Derived Rate Gain: 15% normal rate gain; i.e., 0.33 deg/sec per degree (nominal)

Refer to Figures 3-21 and 3-22 for intercepts for coarse/fine modes of operation.

3.3.6.2.9 Alignment

The alignment tolerances for the Stabilization Subsystem shall be in accordance with the System Acceptance Specification SVS 5388.

3.3.6.2.10 Redundant Pneumatic Control Box (RPCB)

This component shall provide the necessary control to operate the high and low pressure pneumatic systems. It shall control electronic modes, select appropriate control nozzles and balance pressure in the pneumatic storage tanks. (See Figure 3-23).

a. Balance: This function shall equalize the pressure in the two pneumatic tanks. The Balance On command shall provide +28 vdc to the two normally closed balance valves. The valves shall close upon receipt of a balance off command or by a timer in the RPCB, twenty (20) to forty-five (45) seconds after a Balance On Command. A Balance command via AGE shall keep the balance valves open continuously for the duration of this command. (Holding Voltage should be reduced after Balance Valve is opened.)

b. High System Off Command: Upon receipt of this command, the RPCB shall provide a continuous +8 vdc signal to disable the RMA and also initiate an "ACA Low Thrust On" signal to the Pitch, Yaw and Roll ACA's. On Vehicle 90 and subsequent, this command shall also close the High Pressure Branch Selector Valve.

c. Low System Off Command: Upon receipt of this command, the RPCB shall provide a continuous +8 vdc signal to disable the RMA and also initiate an "ACA High Thrust On" signal to the Pitch, Yaw and Roll ACA's. The RPCB shall transfer the Roll High Thrust Solenoid On Signal from the normal high thrust solenoids to the back-up low thrust solenoids. On Vehicle 90 and subsequent, this command shall also close the Low Pressure Branch Selector Valve.

d. High & Low Systems Off Commands: When both the high and low systems are commanded off, the RPCB shall provide a +8 vdc signal to disable the RMA and the Pitch, Yaw and Roll ACA's.

e. High & Low Systems On Commands: Upon receipt of the command the RPCB shall enable normal RMA and ACA operation. On Vehicle 90 and subsequent, this command shall also open the High and Low Pressure Branch Selector Valves.

3.3.6.2.11 Pneumatic Subsystem

The Pneumatic Subsystem shall impart specific control torques to the vehicle upon command from the Stabilization Subsystem electronics. The cold gas which provides the impulse is stored in two spherical tanks. The flight load is 252 ± 1 pound of carbon tetrafluoride (Freon 14) which, when heated to 115°F, shall furnish a stored impulse capability of 10,200 pounds-seconds. There are two pneumatic branches: a high pressure branch and a low pressure branch, to supply two levels of thrust. See Figure 3-24. Each branch has a two (2) cubic foot gas storage tank, a gas pressure transducer, a normally open explosive valve*, a filter-regulator assembly, a regulated pressure transducer, and solenoid valves and nozzles for three axes attitude control. The gas storage tanks are connected by a cross-feed line having two (2) balance/isolation solenoid valves, permitting the transfer of storage gas from one thrust branch to the other on a command basis. The normally open explosive valves* in the individual thrust branches provide for positive shut-off of the primary pneumatic subsystem if BUSS gas is enabled.

* This is true for Task 988 and 989. For Task 990 and subsequent vehicles, the normally open explosive valves in the individual thrust branches are replaced by solenoid latching valves which can be commanded open or close.

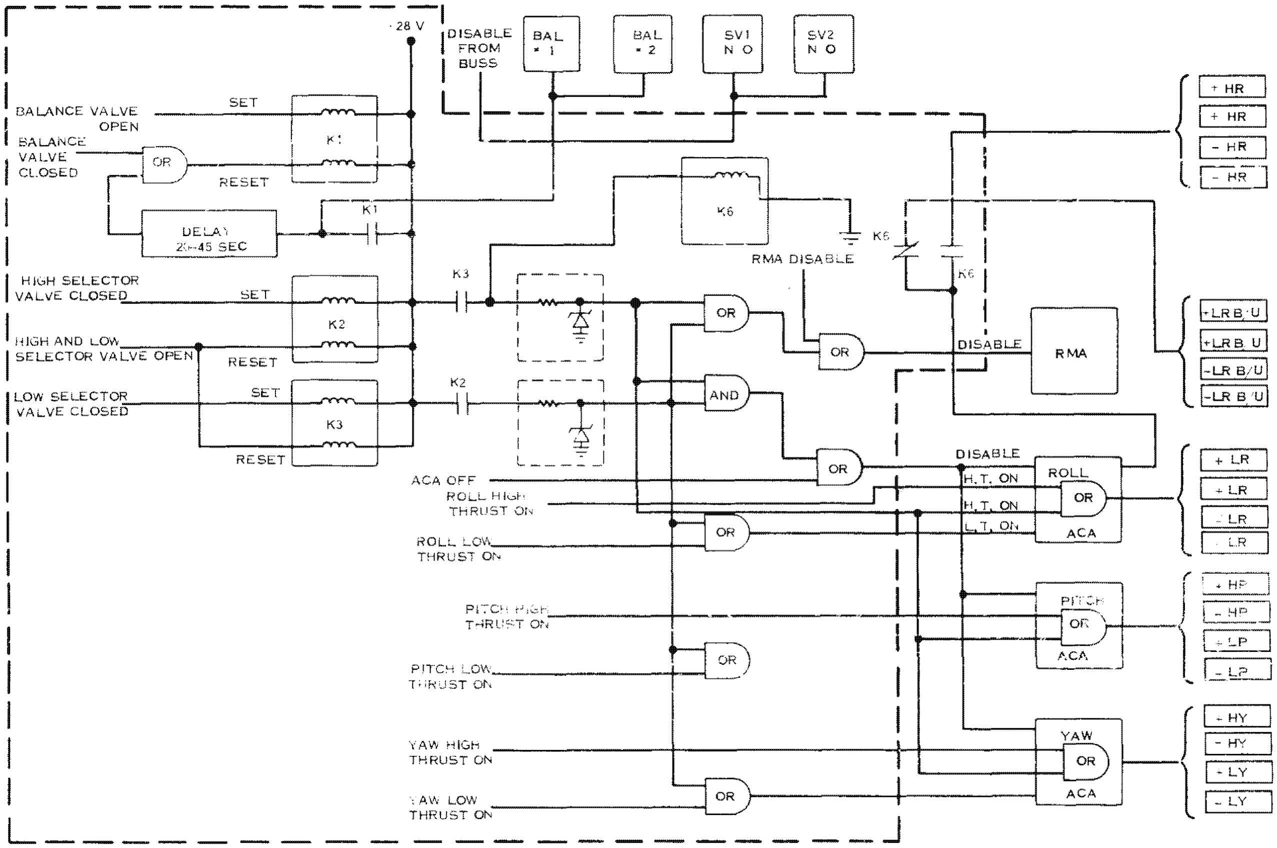

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FIGURE 3-23. (TASK 88 + 89) REDUNDANT PNEUMATIC CONTROL BOX

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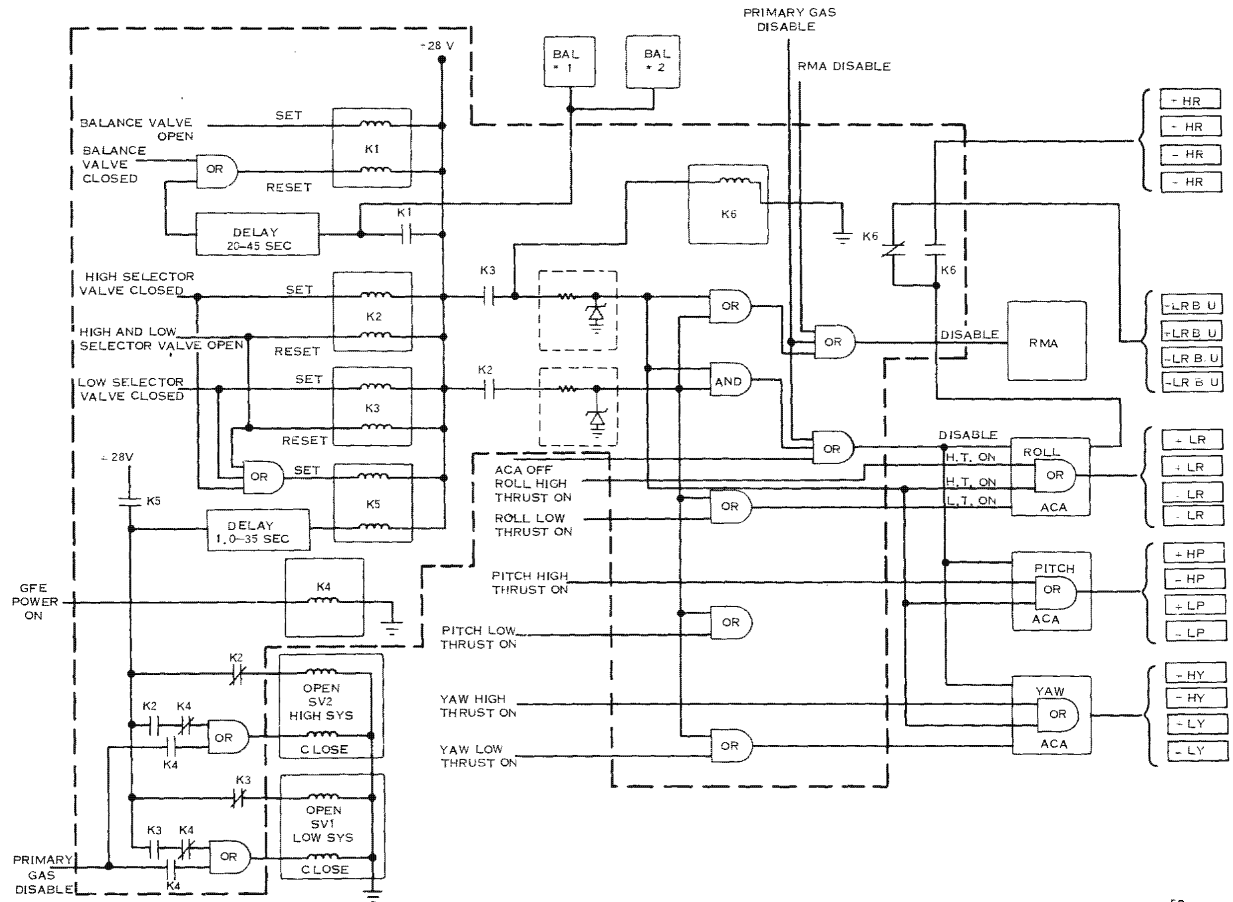

FIGURE 3-23. (TASK 90 + SUBS) REDUNDANT PNEUMATIC CONTROL BOX

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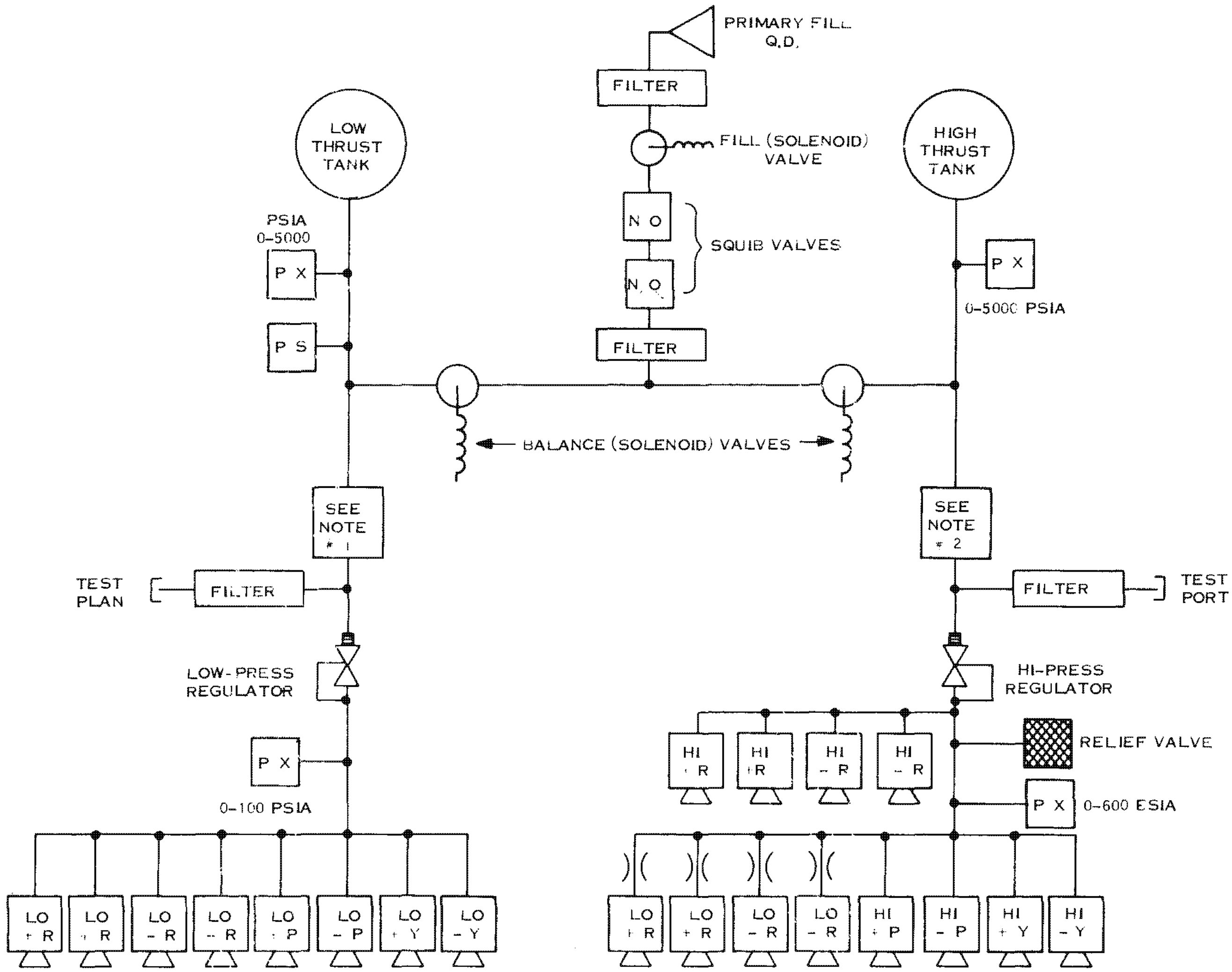

NOTE 1.
TASK 88 & 89
TAB COMPONENT IS A N O SQUIB VALVE,
CLOSED BY A BUSS DISABLE CMD. ONLY.

THIS COMPONENT IS A SOLENOID VALVE. CLOSED BY A PRI GAS DISABLE OR OPENED AND CLOSED BY PRIMARY COMMANDS

FIGURE 3-24. REDUNDANT STAB. PNEUMATICS

The high pressure system downstream of the high pressure regulator is protected from over pressure by a relief valve. The low pressure system is similarly protected by the self-relieving feature of the low roll solenoid valves.

A primary charge point is provided for charging and discharging the gas storage tanks. The charging line contains a quick disconnect, filters, one normally closed solenoid valve and two normally open explosive valves. The normally open explosive valves are actuated approximately 100 seconds after launch to provide a positive seal in the charge line. In flight the storage tanks are heated to maintain stored gas temperatures between the limits of 80° to 120°F. This provides a specific impulse of approximately 40 pound-seconds per pound of gas.

Parameters for the nozzles are as follows:

	Nozzle Thrust (lbs. ±10%)		
	High	Low	Redundant Low
Roll	4.0	0.1306	0.1306
Pitch	7.0	0.8025	0.8025
Yaw	7.0	0.8025	0.8025

3.3.7 ORBIT ADJUST SUBSYSTEM

In addition to the following requirements, the Orbit Adjust Subsystem is defined in SVS 3995E.

3.3.7.1 Description

This subsystem, upon command, supplies impulses or velocity increments (or decrements) to the SV to accomplish orbit corrections as required. The subsystem also provides the impulse which causes the OCV to re-enter. These events are produced by a liquid bipropellant, pressure-fed rocket engine system. Two aft-firing engines are utilized. The pressurant, stored at high pressure in the pressurant tank, is reduced to working pressure by the regulator. Separate pressurant lines from the regulator output pressurize the fuel and oxidizer tanks. Each tank contains an internal bladder which separates the propellant from the pressurant. The pressurant, by acting against the external surface of the bladder, forces the propellants to the thrust chamber. Check valves in each pressurant line furnish protection against intermixing of propellants or propellant vapors. Relief valves provide safety against overpressurization of the subsystem. Flow to the thrust chamber is controlled by orifices. Electrically operated solenoid valves start and terminate propellant flow. Ignition of the propellants in the combustion chamber is by hypergolic reaction of the propellants. See Figure 3-25.

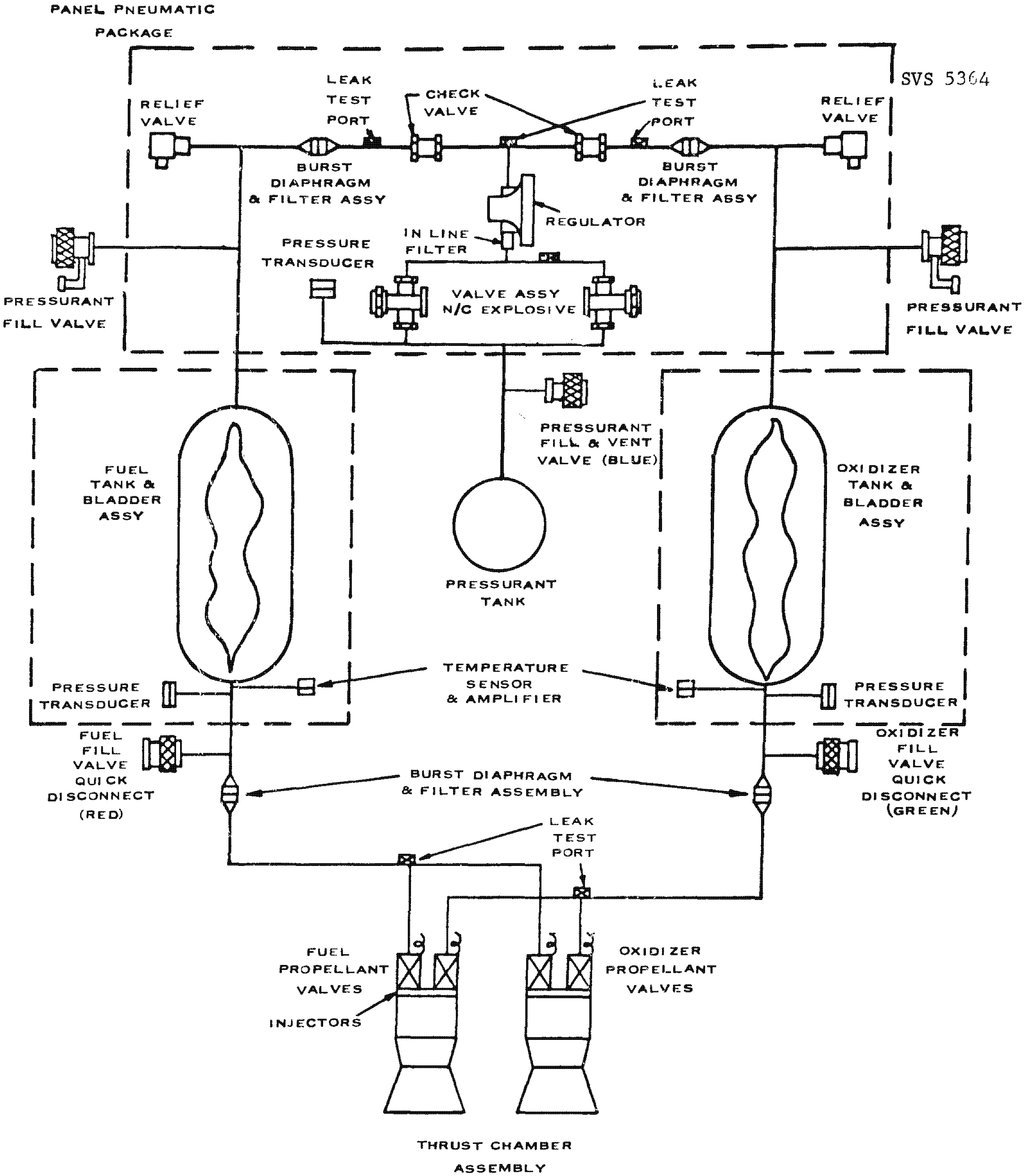

FIGURE 3-25. ORBIT ADJUST SUBSYSTEM

3.3.7.2 Requirements

The following are the requirements for the Orbit Adjust Subsystem:

a. Performance:

1. Total Impulse: The Orbit Adjust Subsystem shall be capable of delivering 80,000 pound-seconds of impulse for SV orbit corrections and OCV deboost. Of this total impulse, the first seven minutes shall provide 40,000 pound-seconds with thrust axis alignment of each thrust chamber maintained within $\pm$ 1/4 degree.

2. Thrust: The thrust of the propulsion system shall be 96 ($\pm$5%) pounds.

3. Response: The minimum required impulse shall be 4 pound-seconds, or that impulse corresponding to a 0.050 second on/off time, whichever is larger. The maximum required impulse shall be 28,800 pound-seconds or that impulse corresponding to a 300 second on/off time, whichever is smaller.

4. Duty Cycle: The subsystem shall provide the required impulse in not more than eight discrete "engine on" periods.

b. Propellants and Pressurant:

1. Propellants: The propellants are:

(a) Fuel: Consists of 25% (by weight) monomethyl hydrazine per MIL-P-27404 and 75% (by weight) hydrazine per MIL-P-26536. The resulting mixture shall conform to SVS 4200.

(b) Oxidizer: Nitrogen Tetroxide per MIL-P-26539.

2. Pressurant: The pressurant is gaseous nitrogen per MIL-P-27401 dried to a dewpoint of -65° and with an oil content of less than 10 ppm. All gas shall be introduced into the system through a filter, the capability of which shall be at least 5 microns nominal, 10 microns maximum.

c. Propellant Expulsion: The propellant tanks each have provisions for a propellant positive expulsion device, which shall enable expulsion of propellants in any vehicle attitude under zero gravity conditions. Expulsion efficiency shall require expulsion of no less than 98% of the propellants in the propellant tanks under maximum loaded conditions.

d. Interface Requirements:

1. Temperature: Under operating conditions the pressurant, propellants and components of the subsystem shall be maintained between +30°F and 120°F. Also, the temperature differential between the fuel bulk temp-perature and the oxidizer bulk temperature shall not exceed 20°F.

2. External Power:

(a) Telemetry: The telemetry sensors used to monitor the operation or condition of the subsystem shall be supplied with +5 vdc $\pm$2%.

(b) Valve Operation: Any electrically operated solenoid valves shall be supplied with 24 to 33 vdc and shall not draw more than 0.75 ampere per valve.

(c) Explosive Components: Any explosive-operated components shall have a minimum firing current consistent with the reliability of the subsystem, but the firing current shall not exceed 5 amperes per bridgewire for a maximum applied duration of 20 milliseconds.

3. Alignment: The thrust axis of the thrust chambers shall pass through the calculated vehicle mean mission center of gravity within 0.06 inch. The thrust axis of the thrust chamber assembly is defined as a line connecting the geometric center of the thrust chamber throat and exit diameter, and is perpendicular to the exit plane within $\pm$0.25 degree.

e. Service and Maintenance:

1. Propellant and Pressurant:

(a) Propellant service access shall be provided for each propellant tank, with suitable valving on the pressurant and propellant side of the positive expulsion device. Capability shall be provided for propellant servicing while the subsystem is assembled in the OCV.

(b) Pressurant: Suitable valving shall be provided which allows service access to the pressurant tank when the subsystem is assembled in the OCV.

(c) Leak Testing: Leak test ports shall be provided throughout the subsystem to allow capability for leak testing all sections of the subsystem after assembly in the OCV.

2. Explosive Devices: Provisions shall be made in the design so that explosive initiators used in the subsystem may be easily installed and removed.

3.3.8 STRUCTURE

In addition to the following, the Structure Subsystem is defined in SVS 5177.

3.3.8.1 Description

The complete vehicle, designated the Satellite Vehicle (SV), is shown in Figure 3-1. This assembly is composed of the Satellite Recovery Vehicle (SRV), the Adapter, and the Orbit Control Vehicle (OCV).

a. The Satellite Recovery Vehicle comprises the Forebody, the Capsule, the Parachute and Thermal Cover, and the Thrust Cone.

1. Forebody: The forebody is a phenolic glass structural liner upon which is bonded a phenolic nylon char and ablation heat shield. The phenolic glass structural liner is 1/8-inch thick and is provided with bonded rings for capsule mounting, for thrust cone mounting, and for mating to the Adapter. The thickness of the phenolic nylon char and ablation heat shield varies from 0.8 inch at the nose to 0.25 inch at its aft edge. The forebody is reinforced internally by three rings. The midring serves as the capsule mounting surface; fore and aft of the midring a series of longitudinal guide surfaces are accurately jigged into position to act as control surfaces for capsule orientation during separation. The capsule is constrained to the midring by four explosive piston devices; the capsule is freed when the explosive pistons are activated to release the parachute thermal cover. Inertial forces maintain contact between the capsule and forebody until parachute deployment causes sufficient deceleration to extract the capsule from the forebody.

2. Capsule: The capsule is constructed of aluminum spun into a hemispherical shape with a brazed-on "Tee" ring for mating with the Forebody ring. Assembly of these two units is by means of four explosive pistons. A phenolic glass rear cover provides environmental sealing. The capsule contains the Telemetry Subsystem, the Recovery Subsystem (except for the parachutes), most elements of the Environmental Subsystem, the auxiliary timer, and the telemetry and recovery batteries.

   The capsule exterior is buffed and plated with a minimum 0.002-inch thick layer of gold by vacuum deposition techniques. The plating is dictated by minimum acceptable absorptivity/emissivity ratios based upon predicted and measured heat flux during mission life. A tungsten-molybdenum disc (Hevimet) is sealed in the forward end of the capsule. The disc serves as ballast for flotation. Additional ballast is added in the form of lead shot within the structural ring at Station 4.35. The final relationship between center of gravity and center of buoyancy assures flotation stability. The capsule is provided with a salt-water activated sink valve below the water line. This valve provides for sinking of the capsule in the event that recovery efforts fail after 72 hours (nominal).

A capsule cover is provided which consists of a molded fibreglass lay-up bonded and riveted to an aluminum ring. This cover is machined for an O-ring which interfaces with the capsule and effects a water-seal. The fibreglass has a saddle-effect depression which is contoured to receive the parachute. The forward face of the cover is silver plated to a depth of 0.0002 inch for thermal and electrical reasons. The cover acts as a mounting structure for ascent valves which vent the capsule during powered flight, a descent valve which vents the capsule during the descent phase, and a pressure relief valve to provide a vent in the event that the sink valve is activated and the capsule is filled with water.

3. Parachutes and Thermal Cover: A deceleration parachute and the main canopy are housed in a "C" shaped pack which sits in two wells in the capsule cover. The pack is enclosed by a thermal cover to protect the contents from wake heating. The same explosive pistons that fasten the forebody and capsule also fasten the cover to the capsule. The explosive pistons, when fired, separate the capsule and forebody and propel the thermal cover rearward with sufficient velocity to overcome wake flow. The force of the rearward moving thermal cover deploys the deceleration parachute which, in turn, deploys the reefed main canopy after a dwell period. The deceleration parachute continues to provide deceleration and stabilization during the 10-second interval before the reefed main canopy is deployed.

4. Thrust Cone: The thrust cone has a truncated cone shape and is fastened by two explosive bolts to the forebody. The unit contains the retrorocket, the spin-up and despin nozzles, valves, tanks, and the ejection programmer. After completion of its functions, the thrust cone (released by the firing of the two explosive bolts) is separated by compressed springs.

b. The adapter forms a structural transition between the RV and Orbit Control Vehicle. The adapter primary structure is of semi-monocoque construction (outside skin, stringers, rings). The outside skin and stringers are fabricated from titanium to accept powered flight heating without recourse to some form of additional shielding. The secondary structure comprises equipment or component mounting racks at two axial station locations. The forward rack ("Tee"-shaped) is located approximately at vehicle Station 65. The aft rack is composed of two beams and two torque boxes, and is located approximately between vehicle Stations 72 to 80.

The adapter is joined to the RV at two points (0 degrees and 180 degrees) by means of forebody tabs and adapter-mounted pin pullers which engage the Forebody tabs. The pin pullers are squib actuated to release the tabs upon demand. The adapter is joined to the OCV via an external lap-joint flange with radial bolts. In addition to doors for access to critical components, the adapter contains the majority of the TT&C equipment such as transmitters, receivers, VHF- and S-band antennas and recorder. Also located in this area are the separation programmer and baroswitches.

c. The Orbit Control Vehicle is of semi-monocoque aluminum construction and is basically divided into the five following portions:

1. The Forward-bay, Section 5: This bay extends from Stations 84 to 125 and contains items of the Environmental Control Subsystem, outer and inner shields, environmental heaters, blankets, controllers, and the inner shield actuation mechanisms.

2. The Mid-bay, Section 6: This bay contains the majority of the on-board components. These include the eight (maximum), batteries, BUSS/Separation Back-up Battery and the necessary power regulation and distribution equipment to support all on-board systems with the exception of the RV retrieval equipment which is supplied from the RV batteries. The Command, Guidance and Control, and portions of the Environmental Control Subsystems are also installed in Section 6. Section 6 mates to Section 5 via a lap joint flange with radial bolts.

3. Station 216 Bulkhead: This bulkhead supports the orbit adjust engines, attitude control nozzles, tanks, and pneumatic regulation equipment as well as the two-axis stable platform. The bulkhead is attached to the Section 8 via bolts in the rear flange.

4. Structural Adapter, Section 7: This section forms the vehicle interface to the SS-01-B vehicle via a conventional inside radial leg flange and eight longitudinal bolts. Immediately aft of this ring is the LMSC aluminum honeycomb structure which is attached to Section 7 by means of 24 bolts. The primary structural joint to the SS-01-B is accomplished at the time of pad-mating through the installation of the eight 0.5-inch steel bolts from the SS-01-B side of the interface.

   The forward end of Section 7 attaches to Section 8 via a "Vee"-band which disconnects by means of four explosive bolts. The SV separation springs, vehicle-powered flight vent ports, and two-axis stable platform stimulators are also located in this section. The section is of semi-monocoque aluminum construction and extends from approximately Station 216 to Station 234.88.

5. BUSS-bay, Section 8: This section encloses the components comprising the backup deboost subsystem. It is of semi-monocoque construction with access doors. The forward tie to Section 6 is riveted while the aft tie to Section 7 is accomplished through the "Vee"-band described in item 4 above.

External access to the vehicle is provided by the following doors (see Figure 3-26).

a. Two large doors covering 45 degrees of the perimeter, each extending from Stations 140 to 188. These doors provide access to the eight batteries.

b. Two doors in line covering 45 degrees of the perimeter, one extending from Stations 125 to 140, and one extending from Stations 155 to 173. These doors provide access to stabilization electronic equipment.

c. The four doors mentioned in items a and b above also provide access to BUSS electronic and pneumatic equipment.

d. One door covering 23 degrees of the perimeter, extending from Stations 140 to 155. This door provides access to several EP&SD components.

e. One door covering 11.25 degrees of the perimeter, extending from Stations 199 to 209 providing access to the BUSS timer.

Also doors are designed as structural members capable of carrying primary loading through structural fasteners and matched and coordinated tooling. Figure 3-27 gives dimensions, volumes, and areas of the Satellite Vehicle.

3.3.8.2 Requirements

3.3.8.2.1 Weight and Balance Requirements

The weight and center of gravity locations in the Satellite Vehicle vary during the mission. This variation is due to the effect of expendable expulsion such as propellants, separation devices, etc.

The total weight of the entire SV at time of launch, including GFE and expendables shall be no greater than 4987 pounds.

The weight and balance requirements of the vehicle at various stages in the mission are defined in Table 3-4.

Table 3-4. Weight and Balance Requirements*

Condition	Weight (pounds)	Center of Gravity: Longitudinal (SV Station No.)	Center of Gravity: Vertical (inches from centerline)	Center of Gravity: Lateral (inches from centerline)
SV	4987	< 153	-0.1±1.5	0±1.0

Condition	Weight (pounds)	Center of Gravity: Longitudinal (SV Station No.)	Center of Gravity: Radial (inches from centerline)
SRV at separation	< 410	< 39.5	0±0.1
RV at re-entry	< 310	< 14 inch from nose	0±0.1
RV (air snatch)	< 200		

Condition	Moment of Inertia (slug-ft²): Roll	Moment of Inertia (slug-ft²): Yaw	Moment of Inertia (slug-ft²): Pitch	Product of Inertia (slug-ft²): Roll/Yaw	Product of Inertia (slug-ft²): Roll/Pitch	Product of Inertia (slug-ft²): Yaw/Pitch
SV at launch	473±20	3300±200	3255±200	0(+90;-25)	0±20	0±20
SRV at separation	Note 1	$\frac{Y-P}{\left(\frac{Y+P}{2}\right)_{avg}}$	=0.10 max	0±0.1	0±0.1	0±0.20
RV at re-entry	Note 2	--	--	0±0.1	0±0.1	0±0.40

* These are absolute limits. Inaccuracies of measurements and of calculations must be added to measured and calculated values before comparing with values in this table.

Note 1: Less than 0.47 times larger SRV lateral inertia value.

Note 2: Less than the smaller RV lateral inertia value.

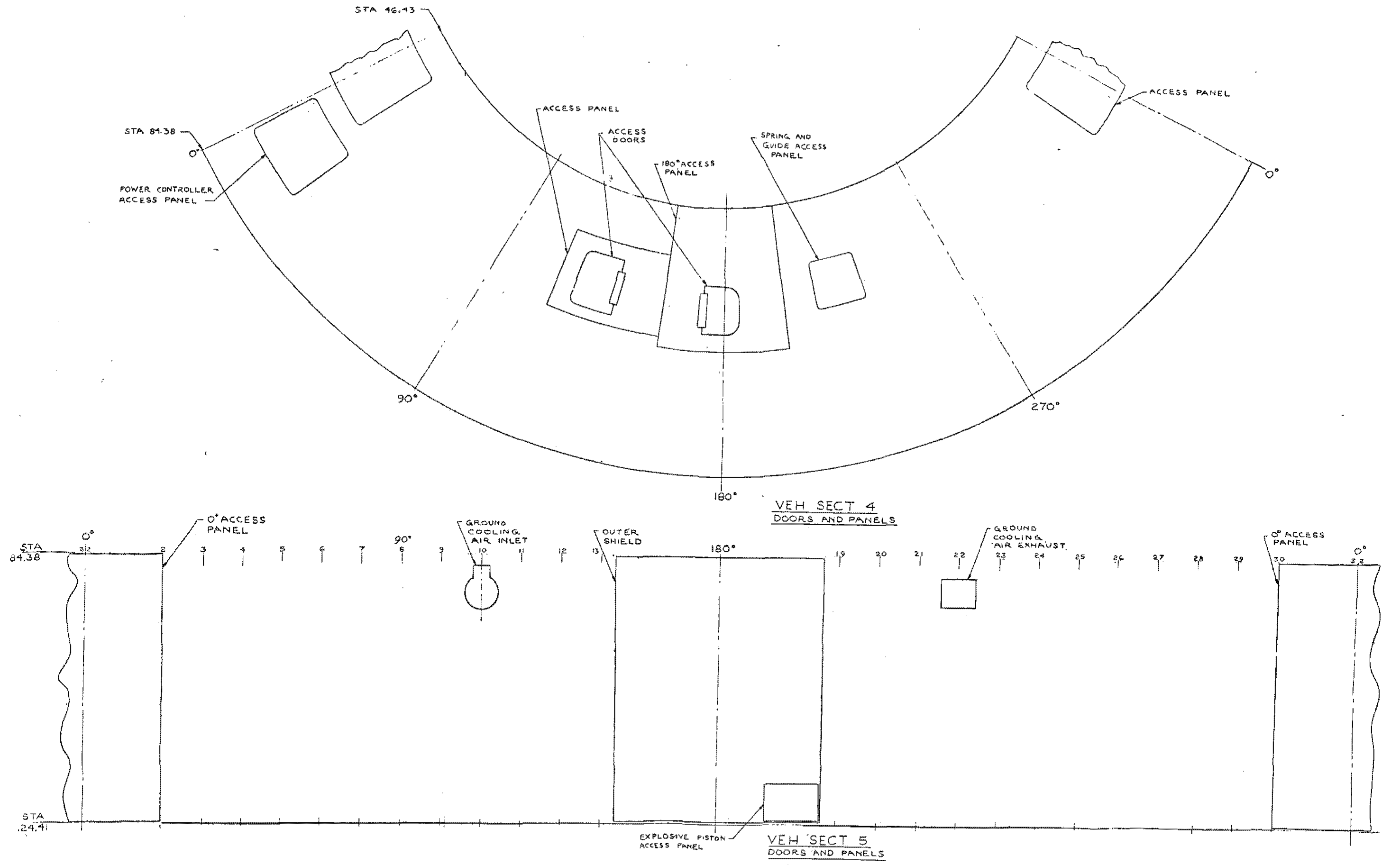

FIGURE 3-26 ACCESS DOOR LOCATION (SHEET 1 OF 2)

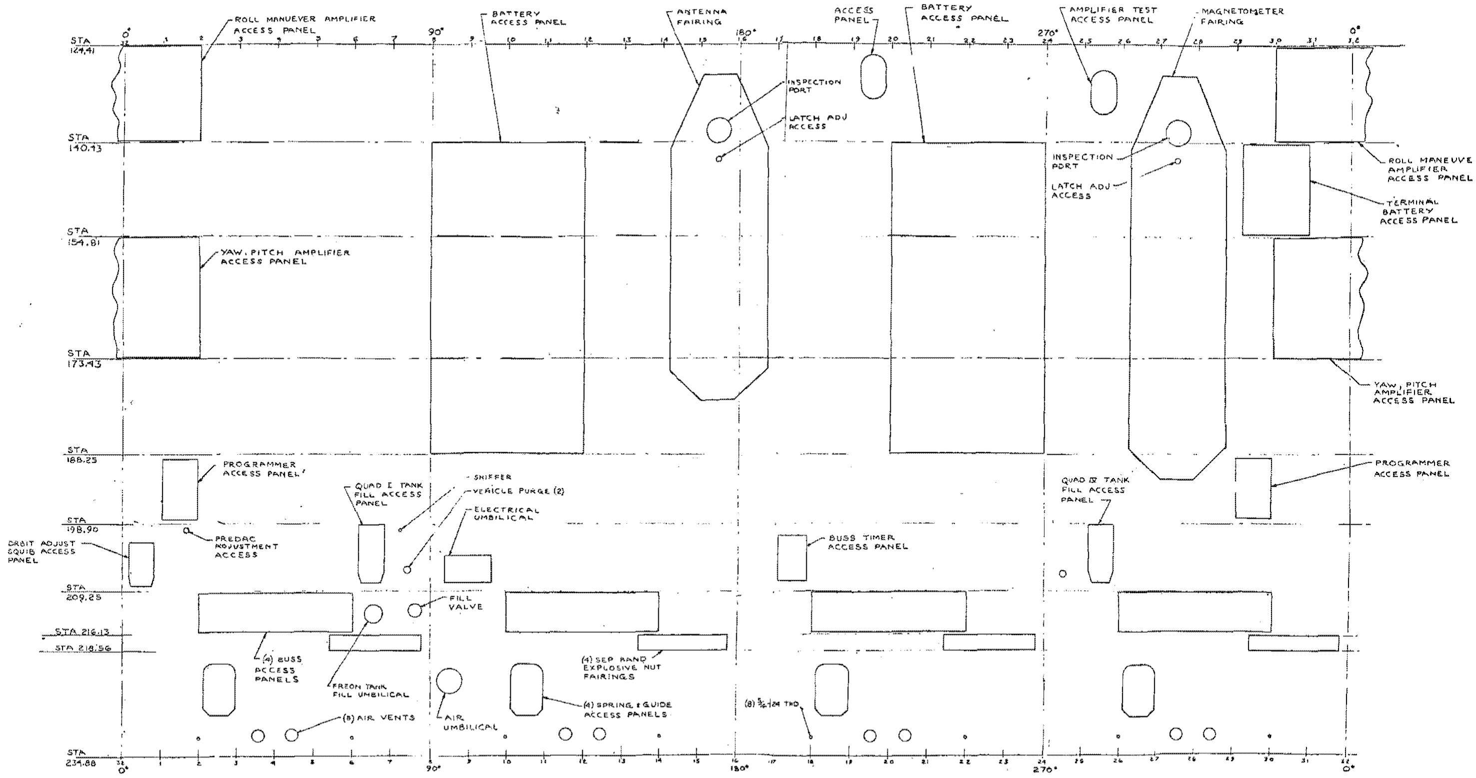

FIGURE 3-26. ACCESS DOOR LOCATIONS (SHEET 2 OF 2)

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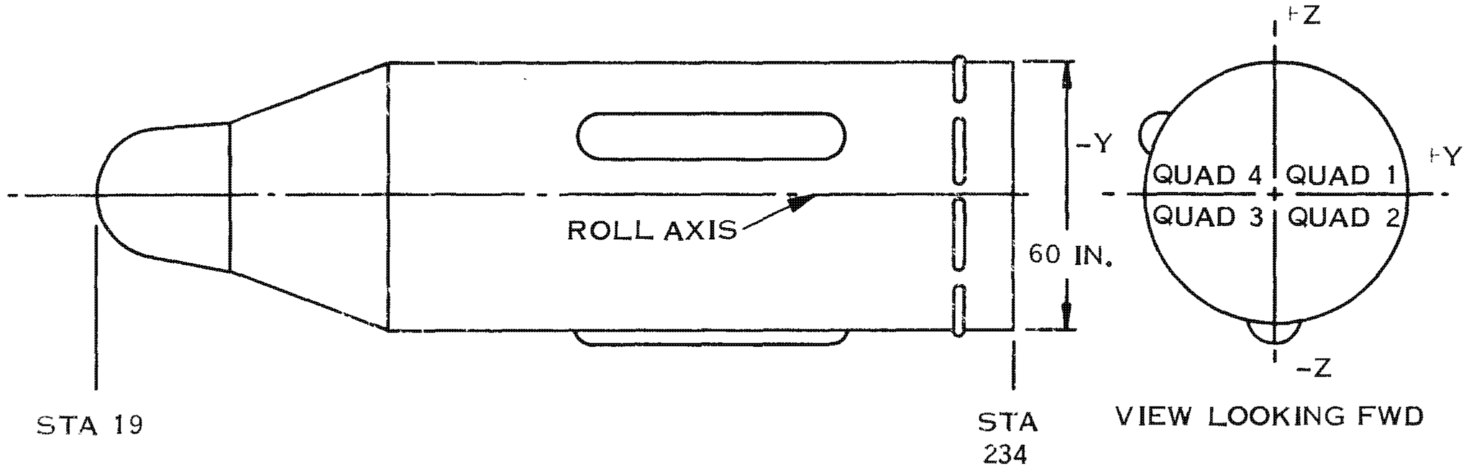

LENGTH = 17.9 FT.

VOLUME = 250 CU. FT.

WETTED AREA = 2.75 SQ. FT.

CROSS SECTION AREA = 19.6 SQ. FT.

FIGURE 3-27. SATELLITE VEHICLE DIMENSIONS, VOLUMES, AND AREAS

3.3.8.2.2 Weight and Balance Measurements

The weight and balance properties of the Satellite Vehicle (in the launch and orbit configuration with expendables loaded) shall be determined within the accuracies shown in Table 3-5.

Table 3-5 Satellite Vehicle Weight and Balance Limits

Item	SRV	RV	SV
Weight (5)	±0.1 (M)	±0.1 (M)	±0.1 (M)
Radial CG (inches)	±0.1 (M)*	±0.1 (M)*	±0.2 (C)
Longitudinal CG (inches)	±0.2 (M)	±0.2 (M)	±1.0 (C)
I_x (%)	±2 (C)	±2 (C)	±7 (C)
I_y (%)	±2 (C)	±2 (C)	±7 (C)
I_z (%)	±2 (C)	±2 (C)	±7 (C)
I_{xy} (slug ft^2)	±0.1 (M)	±0.1 (M)	±5 (C)
I_{xz} (slug ft^2)	±0.1 (M)	±0.1 (M)	±5 (C)
I_{yz} (slug ft^2)	±0.2 (C)	±0.4 (C)	±5 (C)

Note
(M) - Determined by Field measurement
(C) - Determined by weight analysis calculations
* - The indicated value consists of:
0.01 Measurement accuracy
0.04 Repeatability as determined by test
0.05 Other variables

3.3.9 SATELLITE RECOVERY VEHICLE

In addition to the following, the Satellite Recovery Vehicle is described in SVS 5283.

3.3.9.1 Description (See Figure 3-28)

The Satellite Recovery Vehicle is defined in terms of its function and configuration as follows:

a. Function: The SRV shall perform all of the functions of a complete deorbiting re-entry vehicle, which consist of:

1. Sustain all operating environments.
2. Upon separation: deboost from orbit after being positioned in proper pitch-down, yaw-around attitude.
3. Re-enter into the atmosphere.
4. Allow for air-snatch (primary) or water (secondary) retrieval.
5. Provide telemetry data defining deorbit/retrieval events.
6. Provide a VHF beacon signal for tracking and retrieval.
7. Provide destruction or sink capability where necessary.

The forebody shall provide the physical protection needed during re-entry; this section is jettisoned at parachute deployment. The capsule shall provide telemetry signals and retrieval signals. The thrust cone shall provide deorbit propulsion. Upon performing its service, the thrust cone shall be ejected by two explosive bolts and four compressed spring assemblies.

b. Configuration: In order to perform the tasks defined in item a above, the SRV contains the following equipment:

1. Ablative heat shield.
2. Recoverable water-tight capsule.
3. Environmental control.
4. Thermal cover.
5. Destruct mechanisms.
6. Telemetry link.
7. Retrieval devices (light, beacon).
8. Batteries.
9. Auxiliary timer.
10. Parachute.

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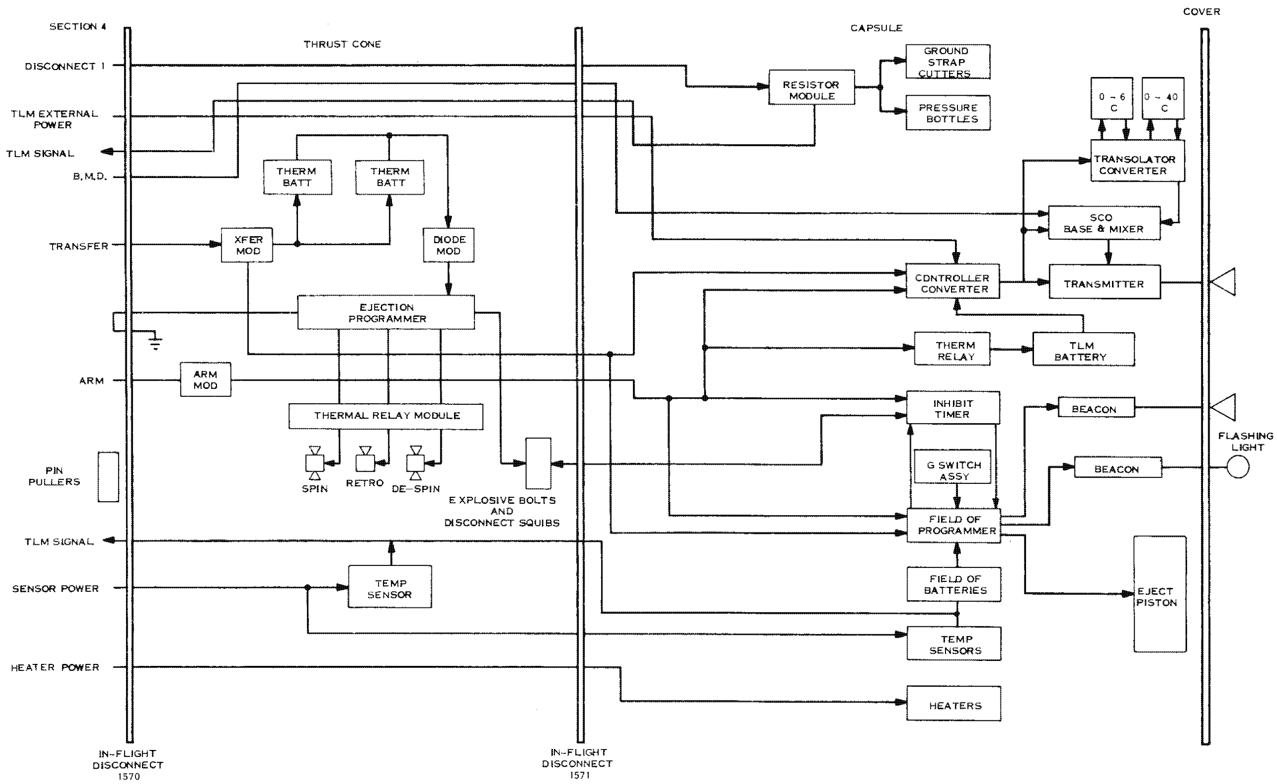

SVS 5364

FIGURE 3-28. SATELLITE RECOVERY VEHICLE, BLOCK DIAGRAM

11. De-orbit propulsion:
    (a) Retrorocket.
    (b) Spin-up nozzles.
    (c) Despin nozzles.
    (d) Spin/despin valves, gas tanks.
12. Ejection programmer.
13. Cone ejection assemblies.
14. Recovery programmer.
15. "G" switch assembly.

5.3.9.2 Requirements

SRV requirements are as follows:

a. Power Sources: A silver/zinc battery supplies SRV telemetry power. The battery is fully activated within 20 seconds after receipt of the Arm command. The ejection package includes two thermal batteries which are activated by the Transfer command. The retrieval package includes two batteries, one of which powers the retrieval beacon upon receipt of the Arm command. After thermal cover ejection, the second retrieval battery parallels the first, and both supply beacon power. SRV heaters and sensors receive power via power cables in the adapter. External power is supplied to the SRV telemetry from power lines in the adapter.

b. RF Links: The self-contained, real-time link provides separation and deorbit data during the descent phase. The telemetry transmitter also acts as a backup beacon. The telemetry link is energized nominally 75 seconds prior to separation. A 1.5-watt (minimum) transmitter operates at 242.0 mc $\pm$0.01%. Telemetry antenna circuit VSWR is 2:1 in the frequency band f_o $\pm$1 mc. Telemetry antenna bandwidth is $\pm$1 mc about f_o. A 0.4-watt average power beacon operates at 235.0 mc $\pm$0.01%. The retrieval beacon begins operating on SRV power upon receipt of the Arm command, and operates continuously for a minimum of 10 hours. Beacon antenna circuit VSWR is 2:1 in the frequency band f_o $\pm$1 mc. Beacon antenna bandwidth is $\pm$1 mc about f_o.

c. Pyrotechnics: Upon receipt of a power pulse at Transfer time, the in-flight disconnect (IFD) located at the adapter/SRV interface shall be disconnected by its associated squibs after the built-in delay of 0.9 (+0.5-0.4) second. Four explosive pistons perform the tasks of thermal cover ejection, decelerator parachute deployment, and separation of the capsule from the forebody.

d. Environmental Control: Thermal equilibrium shall be maintained by use of a fixed low-emissivity coatings on the capsule, electrical heaters, and thermoswitches. The heaters shall be powered from the SV primary battery source during orbital flight. A thermal cover protects the SRV from wake heating during re-entry.

e. Recovery Programmer: This programmer provides a timing reference and recovery event scheduling. Upon receipt of the Arm command the programmer is placed in the armed mode and turns on the recovery beacon. Transfer command provides a redundant power path. The programmer senses a 3 g force, initiates parachute ejection, and turns on the flashing light.

f. Ejection Programmer: This sequencer provides control over the spin, rocket firing, despin, and thrust cone separation events. Upon IFD disconnect of Section 4 from the thrust cone, a continuity loop is opened which provides the Time Zero reference, thus initiating the timing sequence.

g. Auxiliary Timer: This device provides inhibit/destruct capability by:

1. Directing a firing signal to the thrust cone ejection squibs 250 ± 25 seconds after receipt of the Arm command.

2. Providing switching so that redundant programmer time-out and parachute deployment and destruct signals are generated in the event that the g-switches do not perform normally.

The time shall be actuated by the Arm command. Redundant functions shall be provided by the timer at 860 ± 25 seconds, at which time the timer switch closure occurs. Closure dwell time shall be 50 ± 20 seconds.

h. Spin-Despin Mechanism: Upon separation of the SRV from the adapter (at the nominal rate of 1.7 feet per second), the SRV shall be spin-stabilized about the roll axis. After retrorocket firing, the despin exercise shall take place, reducing spin rate to less than 10 rpm. The maximum storage pressure capability of the tank, valves, and lines is 3000 psia. The gas source shall be a mixture of 74 percent nitrogen and 26 percent Freon 14 (by weight).

i. Retrorocket: Upon separation, this solid propellant rocket provides a deorbit total impulse of 10,000 ± 3% pound-seconds.

j. Parachutes: Upon ejection of the thermal cover, the SRV deceleration parachute is deployed. After 10 seconds, the main parachute is deployed and the deceleration parachute is detached. The main parachute shall be fully opened at 50,000 feet altitude (nominal), and shall produce a nominal descent-to-impact period of 30 minutes.

k. Locating Aids: Tracking and locating devices include the recovery beacon, the SRV telemetry transmitter, and a flashing light. The flashing light is actuated upon separation of forebody and capsule.

1. Destruct Mechanisms: A timer is activated at the Arm command for the purpose of parachute and forebody ejection. Should the g-switches fail to close, the parachute and forebody would be deployed above the atmosphere, resulting in SRV destruction due to re-entry heating or high-velocisty impact. A passive sink plug is also incorporated. This plug erodes when in contact with salt water and becomes effective within 55 to 95 hours after impact. An associated air vent permits water entry into the capsule after plug destruction.

3.3.10 BACK-UP STABILIZATION SUBSYSTEM

In addition to the following, the BUSS Subsystem is defined in SVS 5005 and SVS 4400, as modified by Supplement 4.

3.3.10.1 Description

The Back-Up Stabilization Subsystem (BUSS) is a backup command and attitude control system which, in the event of failure of the primary vehicle command or stabilization subsystems, is activated by secure command from the Kodiak, Cook or Pogo tracking stations to orient and stabilize the vehicle for re-entry and to initiate the SRV deorbit sequence.

BUSS comprises a ZEKE command portion and an attitude control portion. The command portion is used to set the BUSS equipment in the proper mode of operation by unsecure tone commands, and to execute the BUSS sequence of operation by secure command. The command portion is completely separate from the primary command system, and includes a separate antenna, receiver, and decoders.

The attitude control portion of BUSS orients and maintains the vehicle in a proper attitude such that satisfactory deorbit of the SRV can be effected. In order to accomplish this, the attitude control portion aligns the vehicle to the earth's magnetic field, pointing the Vehicle Nose towards the magnetic north pole. The angle between the earth's field and the vehicle longitudinal axis is sensed by means of magnetometers.

Upon receipt of the secure command, the BUSS sequence is initiated. The attitude control portion orients and maintains (for a short period of time) the vehicle with respect to earth's magnetic field and generates properly spaced signals to initiate SRV separation and deorbit.

The BUSS is located within the OCV. BUSS is capable of operating in its respective position in the OCV during all SV orbital conditions.

3.3.10.2 Requirements

The following requirements are specified for BUSS.

A. Command

1. The BUSS antenna shall operate at a nominal center frequency of 137.64 MC. The V.S.W.R. in respect to 50 ohms shall be less than 2 to 1 over a bandwidth ±1 MC.

2. The BUSS receiver frequency shall be 137.64 MC ±0.01% and it shall have a sensitivity of 1.5 microvolts at 75% modulation.

3. Unsecure Commands. Two-tone commands shall be used to enable and select the mode of operation to be executed. The first command shall enable the Selective Address "J" Box for a period of nominally 7 seconds to accept a second command. The second command shall arm the BUSS system for the mode of operation to be executed when the system is activated by a secure command.

   The modes of operation shall be BUSS Real Time (BRT), BUSS Next Station (BNS), BUSS Next Orbit (BNO) and BUSS Real Time No Gas (BRTNG). These unsecure commands shall also place BUSS in a test mode by the application of power to the components, sensors and the SV telemetry subsystem necessary to permit status determination of both BUSS and the OCV, upon subsequent execution of BUSS Mode Determination (BMD) unsecure command.

4. Secure Commands.

   a) KiK ZEKE 31

      Any of the above modes of operation shall be executed upon the successful bit-by-bit comparison with the transmitted 35 bit word and the secure key in one type IX Decoder.

   b) KiK ZEKE 32

      A different 35 bit word shall be received and upon the successful bit-by-bit comparison with the secure key in the other type IX Decoder shall activate the PPD in the Primary Command System and provide a signal to advance the Secure Counter.

   c) The Stored Primary commands sequence, ABE then BUX, shall execute the BUSS subsystem in the BUSS Real Time (BRT) mode. See Figure 3-30.

5. The BUSS Command structure shall be as follows:

UNSECURE

COMMAND	TONE FIRST	TONE SECOND	RESULT
Zeke 26	E(4.9KC)	G(5.3KC)	Enable S.A. "J" Box to accept Zeke 21, 22, 23, 24 and 25.
Zeke 21	G(5.3KC)	E(4.9KC)	Arm BUSS Next Station (BNS)
Zeke 22	G(5.3KC)	F(5.1KC)	Arm BUSS Next Orbit (BNO)

UNSECURE (Continued)

COMMAND	TONE FIRST		TONE SECOND	RESULT
Zeke 23	F(5.1KC)		G(5.3KC)	Arm BUSS Real Time (BRT)
Zeke 24	F(5.1KC)		E(4.9KC)	Arm BUSS Real Time No Gas (BRTNG)
Zeke 25	E(4.9KC)		F(5.1KC)	BUSS Mode Determination
		SECURE		
Zeke 31 or 32		A(4.3KC)		Apply Pwr. to Type IX Decoders
		B(4.1KC)		Logical 1
		C(4.5KC)		Logical 0
		D(4.7KC)		Reset Storage Register
ABE	Primary Stored Command			Enable for BUX Cmmd.
BUX	Primary Stored Command			Execute

6. Operational Requirements

a) A lockout feature shall be provided such that the mode of operation cannot be changed by unsecure tones while the transmitted BUSS secure command (KiK Zeke 31) is being received or after it has been executed prior to the time out of the B timer sequence.

b) No lockout feature shall be provided for repeated KiK Zeke 32 secure commands to turn on the PPD in the Primary tommand System.

c) Any (Zeke 26 plus a Zeke 21 or 22 or 23 or 24) unsecure command shall turn on the Verlort Beacon, Orbital Real Time SCO bases, Delta 2 and 3 transmitters, Recorder Playback off and reset the Power Controller timer. Time out of this timer shall turn off the above components. The unsecure command shall also apply power to the BUSS Rate gyro, Flight Control Electronics, Magnetometer Pressure transducer and temperature sensors and initiate the A timer. Time out of this 20 minute timer shall remove power from the aforementioned BUSS components. See Figure 3-29.

d) A KiK Zeke 31 secure command with the proper bit format shall cause the B timer to execute a series of twelve events. The mode of operation selected by the last unsecure command received prior to the secure command shall determine and select for execution the appropriate events. The following table offers the time and events for all modes of operation.

NOTE: The tolerance on all timer settings shall be ±0.1% of the time interval between events or 0.5 seconds, whichever is greater.

B Timer Time (Sec)	BRTNG	Stored Command	BRT	BNS	BNO
Command	KiK Zeke 31	ABE BUX Unsecure Events	KiK Zeke 31------------------------		
	Initiate B Seq.--				
T=0	BUSS Cmmd. #1--				
	N/A	Dis. Primary Pneu.-----------------------------------			
T_1=2	BUSS Cmmd. #2--				
T_2=4	BUSS Cmmd. #3--				
T_3=6				N/A	N/A
	BUSS Cmmd. #4----------------------------			N/A	N/A
	T/M ON----------------------------------			N/A	N/A
	N/A	Enable BUSS Pneu.---------		N/A	N/A
T_4=105.5	BUSS Cmmd. #5----------------------------			N/	N/A
T_5= 108	BUSS Cmmd. #6----------------------------			N/A	N/A
T_6=491	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	T/M ON BUSS Cmd. 4 Enable BUSS Pneu.	N/A N/A N/A
T_7=590.5	N/A	N/A	N/A	BUSS Cmd. 5	N/A
T_8=593	N/A	N/A	N/A	BUSS Cmd. 6	N/A
T_9=5098	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	N/A N/A N/A	T/M ON BUSS Cmd. 4 Enable BUSS Pneu.
T_{10}=5197.5	N/A	N/A	N/A	N/A	BUSS Cmd. 5
T_{11}=5200	N/A	N/A	N/A	N/A	BUSS Cmd. 6
T_{12}=5800	Reset BUSS Sub-System, Enable BUSS Command System--------------------------				

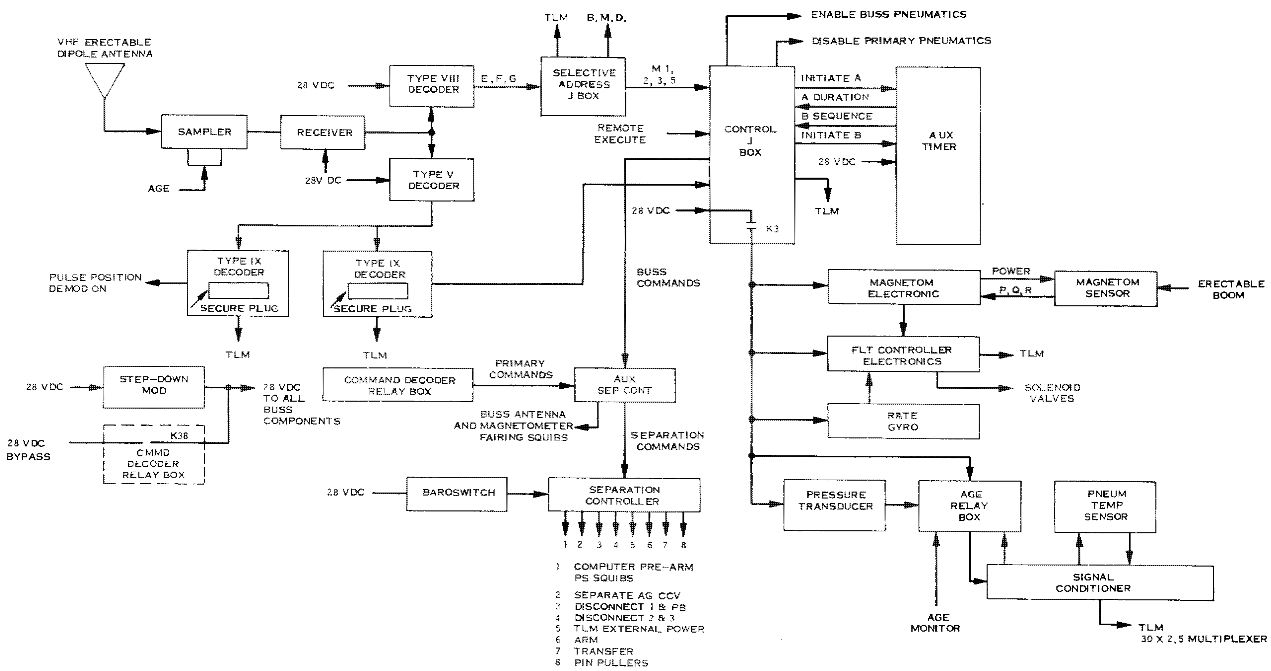

FIGURE 3-29. BUSS SUBSYSTEM & SEPARATION BLOCK DIAGRAM

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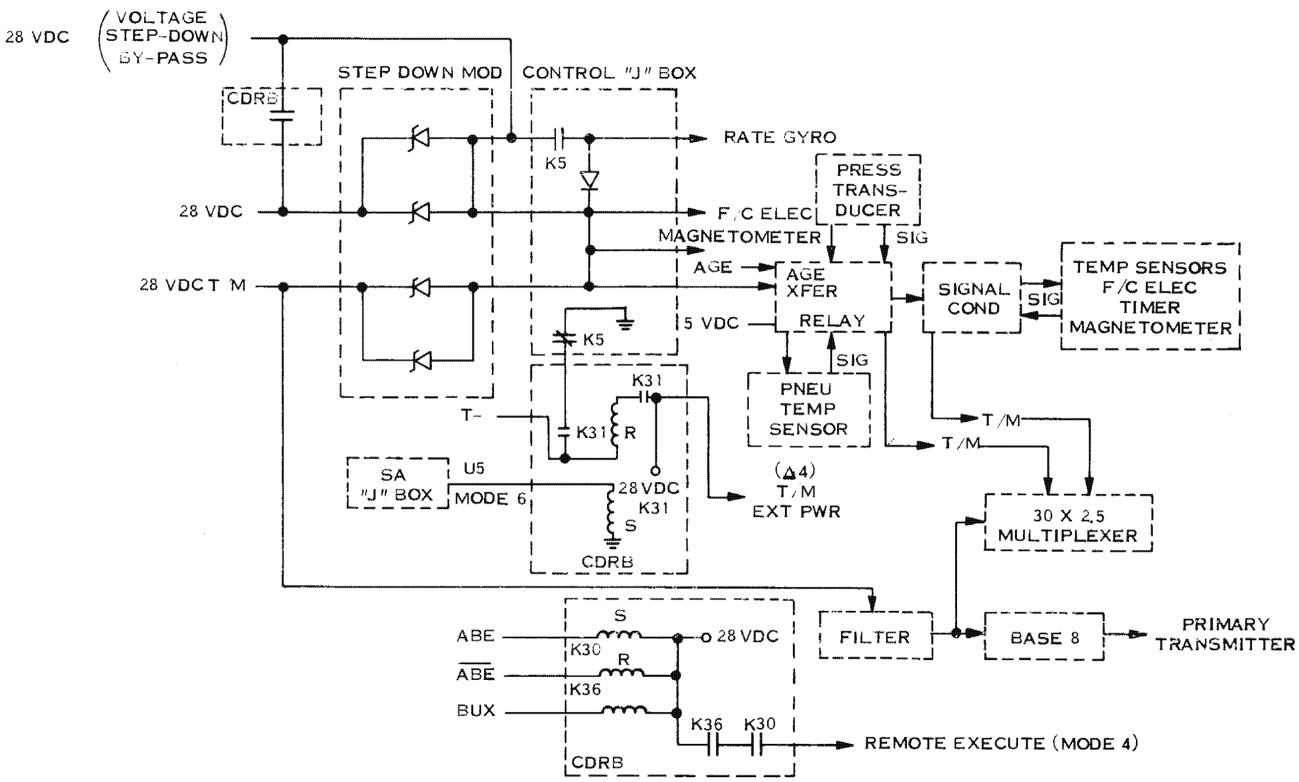

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FIGURE 3-30. BUSS REMOTE EXECUTE, BUSS MODE DETERMINATION, T/M ON & VOLTAGE STEPDOWN BY-PASS

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7. Separation Subsystem: The following commands, as a result of the B Timer outputs shall be sent to the separation auxiliary controller. The following table indicates the routing of the six BUSS separation commands. Voltage of the commands shall be 23.5 to 29.5 VDC.

BUSS Command	Routes To	Separation Controller	Function
1	Command Decoder Relay Box		1C24+ 1C25-
2	Sep. Aux. Cont.	Primary Sep. 3	Disc 1
3	Sep. Aux. Cont.	Sep. 4	Disc. 2 and 3, 1C24 off
4	Sep. Aux. Cont.	Sep. 5/6	△ 4 T/M Ext. Power, Arm
5	Sep. Aux. Cont.	Sep. 7	Transfer
6	Sep. Aux. Cont.	Sep. 8	Pin Pullers

8. Stabilization Subsystem: When in the BRT, BNS, BNO or ABE/BUX Command Mode, the BUSS Subsystem shall deliver a signal at time of execution to a normally open squib valve in the Primary Stabilization Pneumatic Subsystem. This shall result in the disabling of the Primary Stabilization subsystem.

B. Attitude Control: When activated, the attitude control portion shall bring under control and orient an unstabilized or tumbling vehicle to within ±10.3 (3 sigma) degrees of the earth's magnetic vector. Tumbling is defined as a random orientation with negligible body rates about two axes and a body rate about the third axis consistent with the following maximum values: Pitch 4.3 degrees/sec; Yaw 2.8 degrees/sec; and Roll 16.7 degrees/sec. The BUSS attitude control shall orient the vehicle within 90 seconds and shall maintain the vehicle in the desired position for a minimum period of 105 seconds from the time of attitude control activation. Pitch, yaw, and roll rates shall be reduced to ±2 degrees per second or less.

C. Telemetry Subsystem: The following quantities and events are typical telemetry monitor signals:

Item	Sampling Rate (samples per second)
Magnetometer, P	2.5 (Delta 2 and Delta 3)
Magnetometer, Q	2.5 (delta 2 and Delta 3)
Magnetometer, R	2.5 (Delta 2 and Delta 3)
Selective address monitor	2.5
Gas pressure	2.5
Gas temperature	2.5
P-axis valve commands	Continuous
Q-axis valve commands	Continuous
Roll valve commands	Continuous
Power monitor	2.5
Event monitor	2.5
Command monitor	2.5
Secure command monitor	2.5
Mode and event monitor	2.5
Voltage monitor	2.5

Unsecure commands through Zeke command shall turn on the Satellite Recovery Vehicle telemetry so the status of the BUSS subsystem can be determined.

D. Electrical Power and Distribution Subsystem

Provision will be made to bypass one BUSS-mode Zener diode module by primary command but, once commanded, this module will remain bypassed for the remainder of the flight. However, this bypassed module may be reset during ground test with a hardwire command. There is no provision for bypassing the other Zener voltage-dropping diode module, which is in series with the 28 vdc from the primary telemetry test mode. Voltage for the thermostat and heaters mounted on the pneumatic regulator shall be supplied directly from the primary power source.

E. A.G.E. Interface

The following functions shall be provided through the umbilical:

1. RF signal input (coaxial).
2. Command reset.
3. Execute monitor.
4. Gas fill temperature.
5. Gas fill pressure.
6. Solenoid fill valve
7. Auxiliary timer speed-up.

3.3.11 Configuration

The configuration of the Satellite Vehicle shall be in accordance with the drawings and specification listed in Table 3.6 and engineering data assembled thereunder.

TABLE 3.6 SV CONFIGURATION

Item	Description/Nomenclature	Task 88	Task 89	Task 90
1.	Satellite Vehicle Assy.	248E240G41	248E240G42	248E240G43
2.	Interface Drawing	238R802	238R802	238R802
3.	Operational Software/Hdwre. Constraints & Limitations	SVS 5318C	SVS 5318C	SVS 5318C
4.	Ext./Int. Environmental Design Criteria	SVS 4379	SVS 4379	SVS 4379
5.	EMI Deviations to MIL-I-26600, Specification	SVS 4364	SVS 4364	SVS 4364
6.	Command Definition Spec.	SVS 5329G	SVS 5329G	SVS 5329G
7.	System Acceptance Spec.	SVS 5388 Add. 88E	SVS 5388 Add. 89B	SVS 5388 Add. 90A
8.	Operational AGE System Spec.	SVS 3954C	SVS 3954C	SVS 3954C
9.	Interface Spec., Tracking Station	SVS 4201C	SVS 4201C	SVS 4201C
10.	PALC II/SV Interface Spec.	SVS 5013	SVS 5013	SVS 5013
11.	Booster/SV Interface Spec.	SVS 4382 Add. 1	SVS 4382 Add. 1	SVS 4382 Add. 1

3.4 GENERAL FEATURES OF DESIGN AND CONSTRUCTION

3.4.1 SELECTION OF MATERIALS, PARTS, AND PROCESSES

Materials, parts, and processes shall conform to established government specifications (military, federal) where available. Where such government specifications are not available, General Electric Company Specifications have been issued or non-commercial agency (AMS, AISI, SAE, etc.) specifications are utilized.

3.4.2 SERVICE AND ACCESS

For complete serviceability, the vehicle must be completely disassembled; however, a portion of the components are accessible via doors when the vehicle is completely assembled. The access doors are located in the adapter and in the OCV; there are no access doors in the SRV. These access doors permit arming of various squib-actuated devices and provide access to primary batteries, backup battery, stabilization components, and spring and guide assemblies. The exact locations of these doors are listed in the detailed vehicle construction paragraphs.

3.4.3 INTERCHANGEABILITY AND REPLACEABILITY

All components (structural and electrical) are replaceable and interchangeable within the following limits:

a. Some components are matched sets and must be replaced accordingly.

b. Some components require close-tolerance alignments to other portions of the vehicle and therefore considerable time may be expended in order to replace specific components.

c. Some components require extensive testing in the complete vehicle system. This testing would have to be redone.

The major structural components have bolted connections with hole patterns established by matched and coordinated tooling.

3.4.4 IDENTIFICATION AND MARKING

All detail and assembly part numbers are identified per General Electric drawing 118A1526.

Exterior vehicle lettering is done by decals per General Electric drawing 238R847 and 242R607.

3.4.5 LUBRICATION

The design of the vehicle provides for a minimum of lubrication. The number of different lubricants have been kept to a practical minimum. Lubrication requirements for specific equipment and components of the vehicle are specified in the individual equipment specifications.

3.4.6 MAINTAINABILITY

The vehicle has been designed such that component and equipment installation accessibility is as defined in Section 3.4.2. Replaceable or interchangeable components may be removed without disturbing other components.

3.4.7 WORKMANSHIP

Workmanship conforms to the practices prevalent in industry. Uniformity of shapes, dimensions, fit, and performance permits interchangeability of items designated as interchangeable, and permits replaceability of items designated as replaceable. There shall be no cracks, breaks, chips, bends, burrs, loose attaching parts, loose electrical connections, or any other evidence of poor workmanship in the vehicle or its equipment.

3.5 VEHICLE GROUND HANDLING PROVISIONS

3.5.1 SHIPPING CONFIGURATION

All vehicle sections are designed to be supported within containers at the structural hardpoints as follows:

Item	Support
Nose assembly	Full bearing on outer shield (nose down)
Adapter assembly (as shipped)	Bolted support at Station 84
OCV assembly (as shipped)	Bolted supports at Stations 84 and 236

3.5.2 HANDLING CONFIGURATION

The vehicle is designed to be supported while in a horizontal attitude at vehicle hardpoints as follows:

Item	Support
Nose assembly	Full bearing on outer shield
Adapter	Clamped support at Stations 84 and 47
OCV assembly	Clamped supports at Stations 124 and 209

In the vertical attitude, the fully assembled vehicle is designed to be supported at the AGE bolt provisions at Station 230 (eight bolts equally spaced about the circumference of the vehicle) and clamping points at Stations 124 and 209 bulkheads.

All vehicle ground handling provisions are designed for maximum loads of 3 g to yield when the vehicle is in the fully assembled configuration.

SECTION 4

QUALITY ASSURANCE PROVISIONS

4.1 GENERAL

An Acceptance Test Program will be implemented to assure that parts, components, subsystems, and systems conform to design specifications. All acceptance testing will be accomplished in accordance with the quality systems requirements of MIL-Q-9858A.

All acceptance test failures will be documented and screened. Failure analysis will be performed and corrective action will be implemented where applicable. Rework will be performed as required and the hardware will be subjected to retest. Retesting will consist of the entire acceptance test cycle, or whatever portion of the test required to verify that the reworked portion is functioning properly.

4.2 COMPONENT ACCEPTANCE TESTING

4.2.1 GENERAL REQUIREMENTS

All prime components shall be subjected to Acceptance Tests as outlined in the component specification and according to the procedure described in the Quality Control Standing Instruction (SI). The SI coordinates the specification requirements with test equipment and functional procedures. Special cables, test equipment, and procedures are all prescribed in the SI. Environmental conditions will be as specified in SVS 3953B and reflected in the applicable component specification.

All prime components will receive 100 percent acceptance testing and inspection with the exception of one-shot devices such as pyrotechnics and batteries. These items will be subjected to destructive testing on a lot sampling basis as specified in applicable component specifications.

4.2.2 TESTING PERFORMED

Acceptance Tests shall consist of the following:

4.2.2.1 Individual Tests

Individual tests shall consist of:

a. Visual examination of product.
b. Performance tests.

4.2.2.2 Operability Assurance Tests

Operability assurance tests are conducted on each component (excluding BUSS Components; see section 4.2.3.3) to assure a continued high quality level and to disclose potential failures due to production variations. Subsequent to this testing, the components will be dispatched to Bonded Stock or to the Final Assembly Areas.

4.2.3 TEST IMPLEMENTATION

4.2.3.1 Components and Materials Procured from Outside Vendors

Test requirements shall be place on vendors to assure proper identification and operation prior to delivery of hardware to General Electric Spacecraft Department (GE-SD). These requirements will be specified by contractual quality control provisions and controlled by GE surveillance and inspection and Government source inspection.

GE Receiving Inspection shall inspect and test incoming hardware as prescribed by Quality Control Planning. This inspection shall include but not be limited to:

a. Inspection and measurement of physical and mechanical characteristics.

b. Limited electrical tests such as hi-pot insulation resistance, and continuity. GE will perform the operability assurance portion of acceptance tests on those components where the requirement is not placed on the vendor.

4.2.3.2 GE-SD Manufactured Components

All inspection and testing will be controlled by Quality Control Planning which specifies detailed in-process and final inspection testing requirements.

4.2.3.3 BUSS Components

BUSS components are not tested in accordance with normal acceptance test procedures. These components will receive a visual examination for damage upon receipt. If no damage is evident, electrical components are tested on LMSC "Bread Board" No. 1521313-505 (GFE) per Acceptance Test Specification No. 1414246 and SVS 5373. Acceptable components are released for assembly and unacceptable components are returned to LMSC for corrective action. Pneumatic components are installed in the vehicle without GE-SD testing.

4.3 PRESYSTEM ACCEPTANCE TESTING

4.3.1 GENERAL REQUIREMENTS

The requirements which form the basis for the system acceptance test program of prime vehicles for Program 206 are derived from the System Acceptance Specification (SVS 5388) as amended for that specific vehicle under test. All subassemblies, subsystems, and systems shall be tested.

4.3.2 PRESYSTEM TESTING

The objective of presystem testing is to assure that previously accepted components, modules, and/or subsystems will perform to the requirements of SVS 5388 when they are assembled into a major subassembly. Where applicable, components are calibrated, leak-tested, and/or aligned.

4.4 SYSTEMS TESTING

The objective of systems testing is to assure that all subsystems will perform in accordance with SVS 5388 when electrically and/or mechanically mated as a system.

To meet this objective the following tests are performed:

a. System Compatibility Test.

b. System O.A. Vibration Test.

c. System Thermal Vacuum Test.

d. Final System Verification Test (TP-41).

SECTION 5

PREPARATION FOR DELIVERY

The SV is divided into three main components for shipment. They are (a) the SRV, (b) the Adapter, and (c) the OCV. The containers have provision for hoisting, forklifting, and stacking, and have skids with stowable casters. All containers are insulated with polystyrene foam of sufficient thickness to maintain inside temperatures. All containers are equipped with externally visible humidity indicators, shock overload indicators, and seven-day recording thermometers. Center of balance and pick-up points are clearly marked on each container. Each container is cleaned per MIL-P-116 (method C-1) prior to use.

APPENDIX 18

COMMAND DEFINITION SPECIFICATION

CONFIGURATION I-38 AND SUBSEQUENT

INCLUDING ADDENDUM 1

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COMMAND DEFINITION SPECIFICATION

CONFIGURATION I-38 AND SUBSEQUENT (U)

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SPECIFICATION CONTROL

GENERAL ELECTRIC

LIST OF EFFECTIVE PAGES

This document contains 62 pages, consisting of the following:

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INTRODUCTION

THIS DOCUMENT CONTAINS A DETAILED LISTING OF THE DEFINED COMMANDS AND SEQUENCES TO BE USED FOR VEHICLE 988 AND SUBSEQUENT IN THE PROGRAM 206 -COMMAND AND CONTROL- COMPUTER PROGRAMS. CHANGES OR ADDITIONS TO PRECEDING COMMAND DEFINITION SPECIFICATIONS ARE INDICATED BY AN -ASTERISK- ALONG THE RIGHTHAND MARGIN OF EACH PAGE.

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NOTE - USE DEFINED SEQUENCES AT ALL TIMES. ANY EXCEPTIONS TO THIS RULE SHOULD BE THOROUGHLY INVESTIGATED BEFORE USE.

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15	102	PAD 1	MIXED, TC
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17	106	ACQUIRE FWD	MIXED, TC
19	107	SPEC STAT PASS	MIXED, TC
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22	117	IR RECORD [13]	MIXED, TC
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28	132	YAW AROUND TO FWD.	MIXED, TC
29	133	DOWN	MIXED, TC
29	134	UP	MIXED, TC
30	135	AC BACKUP SPECIAL	MIXED, TC
31	136	ROLL MATRIX	MIXED, TC
31	137	AC BACKUP	MIXED, TC
32	138	OCV BLEED-PRES	MIXED, TC
32	139	OCV BLEED	MIXED, TC
33	140	ORBIT ADJUST - 1	NORMAL, MIXED, TC
34	141	ORBIT ADJUST - 2	NORMAL, MIXED, TC
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35	143	GAS DEPLETION	MIXED, TC
35	144	DISCON-1	MIXED, TC
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36	146	ALTERNATE SEPARATE	MIXED, TC
37	147	SEPARATE	MIXED, TC
38	148	SECURE	MIXED, TC
39	149	EMERGENCY RV RECOVERY	MIXED, TC
40	150	OCV DEBOOST-AC	MIXED, TC
41	151	EMERGENCY OCV DEBOOST	MIXED, TC
41	152	RA EXERCISE	MIXED, TC
42	153	IR DORMANCY [R1-]	MIXED, TC
42	154	IR DORMANCY [R1+]	MIXED, TC
43	155	TELL TALE - PRIMARY	MIXED, TC

43	156	TELL TALE - BACKUP	MIXED, TC
43	157	PR CH+ TEST	MIXED, TC
44	158	BUSS EXECUTE [F+]	MIXED, TC

SPC FUNCTION BIT DEFINITION

CMD. TYPE	WORD	BIT NO.	FUNCTION	STATES 1/0	ABBREV.	STATES 1/0
SSPC	1	29	COMPUTER PHASE	A/B	CP	A/B
NO.1	1	30	RECORDER 1	ON/OFF	R1	+/-
	1	31,32	PR2	SET/RESET	PO,PP	00,01
			PR3	SET/RESET	PS,PR	10,11
	1	33	GFE 1-C25	ON/OFF	CP	+/-
	1	34	YAW DB	FINE/COARSE	Y	F/C
	1	35	PITCH DB	FINE/COARSE	P	F/C
	1	36	ROLL DB	FINE/COARSE	R	F/C
SSPC	1	29	TM REAL, BUSS TM	ON/OFF	T	+/-
NO.2	1	30	RECORDER 2	ON/OFF	R2	+/-
	1	31	VERLORT	ON/OFF	S	+/-
	1	33	PPD	ON/OFF	C	+/-
	1	34	GFE 1-C25	ON/OFF	CP	+/-
	1	35,36	TIMER MODE	6R,12R, 6F,CD OFF	6R,12, 6,CD-	00,01 10,11

SPC FUNCTION BIT DEFINITION

CMD. TYPE	WORD	BIT NO.	FUNCTION	STATES 1/0	ABBREV.	STATES 1/0
DSPC	2	31	ARM	ON/NORM	ARM	
NO.1	2	32	ENGINE 1	ON/NORM	E1+	
	2	33	ENGINE 2	ON/NORM	E2+	
	2	34	DISCONNECT 1	ON/NORM	DS1	
	2	35	BUSS EXECUTE	ON/NORM	BUX	
DSPC	2	16	RECORDER 1	ON/OFF	R1	+/-
NO.4	2	17	YAW LEVEL	LOW/HIGH	Y	L/H
	2	18	PITCH LEVEL	LOW/HIGH	P	L/H
	2	19	ROLL LEVEL	LOW/HIGH	R	L/H
	2	21	YAW DB	FINE/COARSE	Y	F/C
	2	22	IR OFF/DS1 ENABLE	ON/OFF	IDE	+/-
	2	23	ACA OFF/BUSS ON ENABLE	ON/OFF	ABE	+/-
	2	26	PITCH DB	FINE/COARSE	P	F/C
	2	27	ROLL DB	FINE/COARSE	R	F/C
	2	28	GFE 1-C15	ON/OFF	TC	+/-
	2	29	FLY,YAW GYRO UNCG.	FWD/NORM	F+	
	2	30	YAW TORQUE	ON/OFF	TQ	+/-
	2	31,33,34	C20/21	ENABLE/DISABLE	0,1	000,101
			GFE 1C20	SET/RESET	2,3	110,111
			GFE 1C21	SET/RESET	A	100
	2	32	FLY,YAW GYRO UNCG.	REV/NORM	F-	
	2	35	RATE ROOFS	OFF/ON	RT	-/+
	2	36	GFE 1-C24	ON/OFF	CH	+/-

SPC FUNCTION BIT DEFINITION

CMD. TYPE	WORD	BIT NO.	FUNCTION	STATES 1/0	ABBREV.	STATES 1/0	
DSPC	1	31	R + P GYRO	UNCAGE/NORM	RPU		
NO.5	1	32	PREDAC BYPASS	ON/NORM	BY		
	1	33	FLY,YAW GYRO UNCG.	REV/NORM	F-		
	1	36	PITCH ZERO	ON/NORM	PZ		
	2	01	PITCH DOWN	ON/NORM	PD		
	2	02	ENVIR PWR ON	ON/NORM	EP+		
	2	03	ENVIR PWR OFF	OFF/NORM	EP-		
	2	04	OCV TANKS	PRES/NORM	PTP		
	2	05	STAR FILL-LINE	SEAL/NORM	SFS		
	2	07	IR SIGNAL	ON/OFF	IR	+/-	
	2	08	SEARCH MODE	OFF/NORM	SM-		
	2	09	GFE 1-C17	ON/NORM	FA		*
	2	10	GFE 1-C18	ON/NORM	RA		*
	2	11	COMPUTER PREARM	ON/NORM	CPR		*
	2	12	IR PREAMP/TOTAL CURRENT RECORD	PREAMP/TOTAL	I	+/-	
	2	13	OCV/AGENA	SEP/NORM	OVS		*
	2	14	DISCONNECT 2	ON/NORM	DS2		*
	2	15	GFE 1-C16	ON/OFF	T	A/M	
	2	16	H30 TRANSFER	ON/NORM	TRA		*
	2	18	GFE 1-C24	ON/OFF	CH	+/-	
	2	19	AC	ON/OFF	AC	+/-	
	2	30	COMPUTER TIMER BYPASS	ON/NORM	CT		
	2	33	RV/OCV SEP	ON/NORM	SEP		
	2	36	OCV ENG	CUTOFF/NORM	E-		

TYPE

DSPC NO.2 EXAMPLE- AA/BB CC.C+DD.DF+DD.DFFF [GG.G/GG.G]

SUB-FIELD	WORD	BITS	FUNCTION	REPRESENTATION
A	1	29-34	GFE 1-C1 TO 1-C6	* TWO OCTAL DIGITS [BITS 29-31,32-34]
B	2	15-20	GFE 1-C1 TO 1-C6	* TWO OCTAL DIGITS [BITS 15-17,18-20]
C			T4 - T1	TIME PERIOD IN SECONDS [10.1 SEC TO 30.5 SEC.]
D	2	2-8	ROLL ANGLE	ROLL ANGLE [DEG.]
	2	21-23	ROLL ANGLE	
	2	26-29	ROLL ANGLE	
E	2	9,10	ROLL RATE	ROLL RATE-LOW [L], MEDIUM [M], OR HIGH [H]
		30,31	ROLL RATE	
F	2	32-36	GFE 1-C8 TO 1-C12	TWO OCTAL DIGITS BITS 32-33, 34-36
G	2	11-14	[T2-T1/	TIME PERIOD [SEC.]
	1	35,36	/T3-T2]	
	2	1		

TYPE

DSPC NO.3 EXAMPLE- AA CCC.C+DD.DEFF

SUB-FIELD	WORD	BITS	FUNCTION	REPRESENTATION
A	1	29-34	GFE 1-C1 TO 1-C6	* TWO OCTAL DIGITS [BITS 29-31,32-34]
C	1	35,36	T2-T1	TIME PERIOD [0.1 TO 102.4 SEC.]
	2	1-8		
D	2	21-23	ROLL ANGLE	ROLL ANGLE [DEG.]
		26-29	ROLL ANGLE	
E	2	30,31	ROLL RATE	ROLL RATE-LOW [L], MEDIUM [M] OR HIGH [H]
F	2	32-36	GFE 1-C8 TO 1-C12	TWO OCTAL DIGITS BITS 32-33, 34-36

* REPRESENT DEC VALUES. SEE NEXT PAGE FOR CONVERSION.

OCTAL TO DECIMAL CONVERSION FOR DSPC 2/3 COMMANDS.

OCT.	DEC.	OCT.	DEC.	OCT.	DEC.	OCT.	DEC.
0 0	3 9	2 0	2 3	4 0	1 5	6 0	6 3
0 1	3 6	2 1	2 0	4 1	1 2	6 1	6 0
0 2	3 3	2 2	1 7	4 2	0 9	6 2	5 7
0 3	3 8	2 3	2 2	4 3	1 4	6 3	6 2
0 4	3 7	2 4	2 1	4 4	1 3	6 4	6 1
0 5	3 4	2 5	1 8	4 5	1 0	6 5	5 8
0 6	3 5	2 6	1 9	4 6	1 1	6 6	5 9
0 7	4 0	2 7	2 4	4 7	1 6	6 7	6 4
1 0	5 5	3 0	0 7	5 0	3 1	7 0	4 7
1 1	5 2	3 1	0 4	5 1	2 8	7 1	4 4
1 2	4 9	3 2	0 1	5 2	2 5	7 2	4 1
1 3	5 4	3 3	0 6	5 3	3 0	7 3	4 6
1 4	5 3	3 4	0 5	5 4	2 9	7 4	4 5
1 5	5 0	3 5	0 2	5 5	2 6	7 5	4 2
1 6	5 1	3 6	0 3	5 6	2 7	7 6	4 3
1 7	5 6	3 7	0 8	5 7	3 2	7 7	4 8

FOR THE PURPOSE OF DOING -CANNED- ROLL EXERCISES AND VEHICLE STABILIZATION HEALTH CHECKS PROCEED AS NOTED BELOW. THE RATE VALUES STATED ARE ANTICIPATED VALUES, NOT SPEC VALUES, ASSOCIATED WITH CURRENT NOZZLE SIZE AND INERTIA CONFIGURATION.
THE FOLLOWING EMPIRICAL FORMULAS AND CRITERIA SHOULD BE UTILIZED WHEN DEFINING DSPC 2/3 COMMANDS IN SEQUENCES TO INSURE SUFFICIENT TIME INTERVALS FOR ROLL MANEUVER COMPLETION. THE TOTAL TIME TO COMPLETE A ROLL MANEUVER FOR A GIVEN ROLL RATE IS AS FOLLOWS -

LOW RATE, [DEL THETA/0.26] + 3.0 SEC. [DOES NOT APPLY FOR DEL THETA = 0.709 DEG.]

MED RATE, [DEL THETA/1.61] + 1.6 SEC. [DOES NOT APPLY FOR DEL THETA = 0.709 DEG.]

HIGH RATE, [DEL THETA/3.12] + 2.6 SEC. [APPLICABLE FOR DEL THETA GREATER THAN OR EQUAL TO 4.963 DEG. ONLY]

WHERE DEL THETA=THE DELTA ANGLE BETWEEN ROLL MANUEVERS.

A MANEUVER OF 0.709 DEG. SHOULD BE PERFORMED IN LOW AND TAKES A TOTAL TIME OF 5.5 SEC. THE MINIMUM DEL THETA FOR THE HIGH RATE IS 4.963 DEG.

THE [7] BITS CORRESPONDING TO A GIVEN ROLL ANGLE ARE CALCULATED AS FOLLOWS-

$$[X]_2 = 64 - [THETA/0.709]$$

WHERE [1] THETA IS A +/- ANGLE ROUNDED TO THE NEAREST TENTH, IN THE RANGE FROM -44.7 TO +45.4 DEG.
[2] THE QUANTITY, [THETA/0.709] IS ROUNDED TO THE NEAREST WHOLE NUMBER.

WHEN $[X]_2$ IS CALCULATED AND REPRESENTED BY 7 BITS, REVERSE THEIR ORDER AND PLACE THEM IN THEIR RESPECTIVE DSPC 2/3 COMMAND BIT POSITIONS.

THE MATRIX OF BITS REPRESENTING ROLL RATES IS - LOW 00
MED 01
HIGH 11

DSPC 2/3 TIME PERIODS AND THEIR BINARY CONFIGURATION ARE AS FOLLOWS -

A] DSPC 2

[T2-T1] OR [T4-T3-0.1]

[1] SECONDS

$[T2-T1]_{10} = 3.5_{10} + X[0.4]_{10}$

WHERE $X_{10} = 0, 1, 2. ... 15$

[2] BINARY - REVERSE THE ORDER OF THE FOUR BITS WHICH REPRESENT $[X]_2$

[T3-T2]

[1] SECONDS

$[T3-T2]_{10} = 3.0_{10} + Y[1.2]_{10}$

WHERE $Y_{10} = 0, 1, 2. ... 7$

[2] BINARY - REVERSE THE ORDER OF THE THREE BITS WHICH REPRESENT $[Y]_2$

[T4-T1]

[T4-T1] = 2[T2-T1] + [T3-T2] + 0.1

B] DSPC 3

[T2-T1]

[1] SECONDS

$[T2-T1]_{10} = [[1023 - Z]/10]_{10}$

WHERE $Z_{10} = 0, 1, 2, ... 1022$

[2] BINARY - REVERSE THE ORDER OF THE TEN BITS WHICH REPRESENT $[Z]_2$

AS SPECIAL CASE

WHEN $[T2-T1]_{10} = 102.4$ SEC. THE 10 BITS ARE GIVEN BY 1111111111

THE QUANTITY $[T2-T1]_{10} = 0$ SEC. DOES NOT EXIST

THE TABLE BELOW MAY BE USED ON ORBIT FOR ASSISTANCE IN CALCULATING TIME TAGS AND DEFINING DESCRIPTORS FOR ROLL MANEUVER SEQUENCES THAT ARE NOT DEFINED IN THIS SPECIFICATION.

DELTA STEP	DELTA ROLL [DEG]	LOW	MEDIUM	HIGH
1	0.709	5.5		
2	1.418	8.5	2.5	
3	2.127	11.2	3.0	
4	2.836	14.0	3.4	
5	3.545	16.7	3.9	
6	4.254	19.4	4.3	
7	4.963	22.1	4.7	4.2
8	5.672	24.9	5.2	4.5
9	6.381	27.6	5.6	4.7
10	7.090	30.3	6.1	4.9
11	7.799	33.0	6.5	5.1
12	8.508	35.8	6.9	5.4
13	9.217	38.5	7.4	5.6
14	9.926	41.2	7.8	5.8
15	10.635	44.0	8.3	6.1
16	11.344	46.7	8.7	6.3
17	12.053	49.4	9.1	6.5
18	12.762	52.1	9.6	6.7
19	13.471	54.9	10.0	7.0
20	14.180	57.6	10.5	7.2
21	14.889	60.3	10.9	7.4
22	15.598	63.0	11.3	7.6
23	16.307	65.8	11.8	7.9
24	17.016	68.5	12.2	8.1
25	17.725	71.2	12.7	8.3
26	18.434	74.0	13.1	8.6
27	19.143	76.7	13.5	8.8
28	19.852	79.4	14.0	9.0
29	20.561	82.1	14.4	9.2
30	21.270	84.9	14.9	9.5
31	21.979	87.6	15.3	9.7
32	22.688	90.3	15.7	9.9
33	23.397	93.0	16.2	10.1
34	24.106	95.8	16.6	10.4
35	24.815	98.5	17.1	10.6
36	25.524	101.2	17.5	10.8
37	26.233	103.9	17.9	11.1
38	26.942	106.7	18.4	11.3
39	27.651	109.4	18.8	11.5
40	28.360	112.1	19.3	11.7

CONTINUED

DELTA STEP	DELTA ROLL [DEG]	LOW -----	MEDIUM ------	HIGH ----
41	29.069	114.9	19.7	12.0
42	29.778	117.6	20.1	12.2
43	30.487	120.3	20.6	12.4
44	31.196	123.0	21.0	12.6
45	31.905	125.8	21.5	12.9
46	32.614	128.5	21.9	13.1
47	33.323	131.2	22.3	13.3
48	34.032	133.9	22.8	13.6
49	34.741	136.7	23.2	13.8
50	35.450	139.4	23.7	14.0
51	36.159	142.1	24.1	14.2
52	36.868	144.8	24.5	14.5
53	37.577	147.6	25.0	14.7
54	38.286	150.3	25.4	14.9
55	38.995	153.0	25.9	15.1
56	39.704	155.8	26.3	15.4
57	40.413	158.5	26.8	15.6
58	41.122	161.2	27.2	15.8
59	41.831	163.9	27.6	16.1
60	42.540	166.7	28.1	16.3
61	43.249	169.4	28.5	16.5
62	43.958	172.1	29.0	16.7
63	44.667	174.8	29.4	17.0
64	45.376	177.6	29.8	17.2
65	46.085	180.3	30.3	17.4
66	46.794	183.0	30.7	17.6
67	47.503	185.8	31.2	17.9
68	48.212	188.5	31.6	18.1
69	48.921	191.2	32.0	18.3
70	49.630	193.9	32.5	18.6
71	50.339	196.7	32.9	18.8
72	51.048	199.4	33.4	19.0
73	51.757	202.1	33.8	19.2
74	52.466	204.8	34.2	19.5
75	53.175	207.6	34.7	19.7
76	53.884	210.3	35.1	19.9
77	54.593	213.0	35.6	20.1
78	55.302	215.7	36.0	20.4
79	56.011	218.5	36.4	20.6
80	56.720	221.2	36.9	20.8
81	57.429	223.9	37.3	21.1
82	58.138	226.7	37.8	21.3
83	58.847	229.4	38.2	21.5

7
0

CONTINUED

DELTA STEP	DELTA ROLL [DEG]	LOW	MEDIUM	HIGH
86	60.974	237.6	39.5	22.2
87	61.683	240.3	40.0	22.4
88	62.392	243.0	40.4	22.6
89	63.101	245.7	40.8	22.9
90	63.810	248.5	41.3	23.1
91	64.519	251.2	41.7	23.3
92	65.228	253.9	42.2	23.6
93	65.937	256.7	42.6	23.8
94	66.646	259.4	43.0	24.0
95	67.355	262.1	43.5	24.2
96	68.064	264.8	43.9	24.5
97	68.773	267.6	44.4	24.7
98	69.482	270.3	44.8	24.9
99	70.191	273.0	45.2	25.1
100	70.900	275.7	45.7	25.4
101	71.609	278.5	46.1	25.6
102	72.318	281.2	46.6	25.8
103	73.027	283.9	47.0	26.1
104	73.736	286.6	47.4	26.3
105	74.445	289.4	47.9	26.5
106	75.154	292.1	48.3	26.7
107	75.863	294.8	48.8	27.0
108	76.572	297.6	49.2	27.2
109	77.281	300.3	49.7	27.4
110	77.990	303.0	50.1	27.6
111	78.699	305.7	50.5	27.9
112	79.408	308.5	51.0	28.1
113	80.117	311.2	51.4	28.3
114	80.826	313.9	51.9	28.6
115	81.535	316.6	52.3	28.8
116	82.244	319.4	52.7	29.0
117	82.953	322.1	53.2	29.2
118	83.662	324.8	53.6	29.5
119	84.371	327.6	54.1	29.7
120	85.080	330.3	54.5	29.9
121	85.789	333.0	54.9	30.1
122	86.498	335.7	55.4	30.4
123	87.207	338.5	55.8	30.6
124	87.916	341.2	56.3	30.8
125	88.625	343.9	56.7	31.1
126	89.334	346.6	57.1	31.3
127	90.043	349.4	57.6	31.5

SEQUENCE NO. 101, 102, 103, 104 - PAD 1, 2, 3 AND 4

USAGE - THESE PRE-LAUNCH CHECKOUT SEQUENCES ARE PAD LOADED AT VAFB IN DELAY LINES 1, 2, 3, AND 4 RESPECTIVELY. ZERO TIME FOR THE SEQUENCE IS LIFT OFF MINUS 100 SECONDS.
COMMAND 283 IN SEQUENCE 104 IS USED TO KEEP THE RECORDER ON DURING POWERED FLIGHT.

SEQUENCE 101 - PAD 1

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+1.0	219	T+R2-S+C+CP-6R	1	T+T ON,PPD ON CP-
+2.0	219	T+R2-S+C+CP-6R	2	PPD ON
+3.0	219	T+R2-S+C+CP-6R	3	PPD ON
+4.0	219	T+R2-S+C+CP-6R	4	PPD ON

SEQUENCE 102 - PAD 2

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+13.0	219	T+R2-S+C+CP-6R	1	T+T ON,PPD ON CP-
+14.0	219	T+R2-S+C+CP-6R	2	PPD ON
+15.0	219	T+R2-S+C+CP-6R	3	PPD ON

SEQUENCE 103 - PAD 3

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+23.0	219	T+R2-S+C+CP-6R	1	T+T ON,PPD ON CP-
+24.0	233	T+R2-S+C+CP-12	2	T+T ON,PPD ON CP-,MODE 12R *

SEQUENCE 104 - PAD 4

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+31.0	219	T+R2-S+C+CP-6R	5	PPD ON *
+42.0	482	01 000.1+00.0L14	1	ROLL + 0.0L
+44.0	192	T+R2-S+C-CP-12	2	PPD OFF
+45.0	283	CPB R1+PO CP-YF PC RC	3	REC.ON

SEQUENCE NO. 105 - ACQUIRE TUMBLE

USAGE - AGENA/SV TUMBLING TO SV ACQUISITION

SET PREDAC TO PITCH ZERO. SEPARATE SV/AGENA, ACTIVATE AC STABILIZATION SYSTEM, UNCAGE R + P GYROS - STABILIZE ON THESE AXES. DAMP OUT YAW RATE. AT A LATER TIME WHEN TELEMETRY DATA INDICATES R, P, + Y AXES ARE ACQUIRED FORWARD, SEARCH MODE OFF SHOULD BE COMMANDED USING COMMAND NUMBER 387.

THIS SEQUENCE SHOULD BE FOLLOWED BY 2 RECORD SEQUENCES TO RECORD IR PREAMP FOR THE ENTIRE ORBIT.

SEQUENCE 105 - ACQUIRE TUMBLE

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 40.0	395	PZ IR-I+TM CH+AC-	12	PITCH ZERO,CH+ IR PREAMP
- 10.0	332	R1+YLF PHC RHC IDE-ABE-TC-TQ-RT+CH+0	7	REC.ON,RT+
+ 0.0	370	IR-I+OVS TM CH+AC-	1	OCV/AG SEP
+ 3.6	395	PZ IR-I+TM CH+AC-	11	AC INIT.
+ 3.9	332	R1+YLF PHC RHC IDE-ABE-TC-TQ-RT+CH+0	2	AC INIT.
+ 4.2	381	RPU IR-I+TM CH-AC+	3	CH-,RPU,ACA ON
+ 11.9	309	R1+YLF PLC RLC IDE-ABE-TC-TQ-RT-CH-0	6	STAB.INIT
+ 12.2	385	IR+I+TM CH-AC+	4	IR ON
+132.5	482	01 000.1+00.0L14	10	ROLL + 0.0L
+132.8	312	R1+YLC PLC RLC IDE-ABE-TC-F+TQ-RT-CH-0	5	STAB.INIT FLY FWD
+400.0	291	TIMER RESET	9	KEEP REC.ON
+530.0	323	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	8	REC.OFF STAB.INIT
+530.3	389	IR+I-TM CH-AC+	13	TOTAL I

SEQUENCE NO. 106 - ACQUIRE FWD

USAGE - AGENA STABLE FORWARD TO SV ACQUISITION
WITH AGENA CONTROLLING ATTITUDE IN A STABLE HORIZONTAL FLY-FORWARD CONDITION, THIS SEQUENCE WILL SEPARARATE THE SV FROM AGENA AND INITIALIZE SV ATTITUDE CONTROL TO A COARSE LIMIT CYCLE, HORIZONTAL, FLY-FORWARD CONDITION.

ZERO TIME OF THIS SEQUENCE IS LIFT OFF PLUS 700 SECONDS. THIS REQUIREMENT IS TO AVOID ANY CONFLICTS WITH AGENA VENTING FOLLOWING AGENA ENGINE CUTOFF.

SEQUENCE 106 - ACQUIRE FWD

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-580.0	372	SFS IR-I-TM CH+AC-	17	FILL SEAL
- 60.0	332	R1+YLF PHC RHC IDF-ABE-TC-TQ-RT+CH+0	8	RFC.ON,CH+,RT+
- 40.0	391	P7 IR-SM-I-TM CH+AC-	15	PITCH ZERO SM OFF
- 20.0	375	IR-CPR I-TM CH+AC-	2	CPR *
- 19.7	283	CPB R1+PO CP-YF PC RC	18	CPB
+ 0.0	378	IR-I-OVS TM CH+AC-	1	OCV/AG SEP *
+ 3.6	391	P7 IR-SM-I-TM CH+AC-	14	SM OFF
+ 3.9	332	R1+YLF PHC RHC IDF-ABE-TC-TQ-RT+CH+0	3	STAR.INIT
+ 4.2	381	RPU IR-I+TM CH-AC+	4	CH-,RPU,ACA ON
+ 11.9	309	R1+YLF PLC RLC IDF-ABE-TC-TQ-RT-CH-0	7	STAR.INIT,RT-
+ 12.2	385	IR+I+TM CH-AC+	5	IR ON
+ 70.0	309	R1+YLF PLC RLC IDF-ABE-TC-TQ-RT-CH-0	13	AC INIT.
+ 70.3	396	P7 IR+I+TM CH-AC+	12	AC INIT.
+ 70.6	283	CPB R1+PO CP-YF PC RC	11	AC INIT.
+100.0	312	R1+YLC PLC RLC IDF-ABE-TC-F+TQ-RT-CH-0	6	STAR.INIT FLY FWD
+132.5	482	01 000.1+00.0L14	10	ROLL + 0.0L
+300.0	286	CPB R1-PO CP-YC PC RC	9	RFC.OFF
+310.0	389	IR+I-TM CH-AC+	16	TOTAL I

SEQUENCE NO. 108 - STAT PASS

USAGE - STATION PASS SEQUENCES WILL ALL HAVE THE SAME SEQUENCE NUMBER DESIGNATOR, [NO. 108], HOWEVER, THE INDIVIDUAL COMMANDS MAKING UP THIS SEQUENCE WILL VARY. IN GENERAL, A STATION PASS SEQUENCE WILL USUALLY CONSIST OF THREE [3] STORED PROGRAM COMMANDS [3-SSPC2-S]. THE FOLLOWING WILL BE ACCOMPLISHED BY THE INDIVIDUAL COMMANDS, WHERE T1 = 0 DEGREE CONE ENTER.

1ST COMMAND [TIME = T1-90.0 SEC] TURN ON TRACKING AND TELEMETRY [REAL TIME TM ONLY] EQUIPMENT, AUX TM ON, AND [IF DESIRED] REC OFF MODE 2 [PLAYBACK].
2ND COMMAND [TIME = T2] TURN ON PPD COMMAND LINK IF DESIRED, AT 4 DEGREE CONE ENTRY [OR LATER] IN ADDITION TO EQUIPMENT ALREADY ON.
3RD COMMAND [TIME = T3] TURN OFF ALL TT+C FUNCTIONS AT 2 DEGREE CONE EXIT, POWER CONTROLLER [P.C.] REMAINS ON.

THE POWER CONTROLLER TIMER BITS IN ALL THE TYPE SSPC-2 COMMANDS WILL SELECT THE 6 MINUTE RESETTABLE MODE. IN THE EVENT THAT TIME SPACING BETWEEN ADJACENT COMMANDS EXCEEDS 5.25 MINUTES THE TIMER RESET COMMAND, NO. 291, WILL BE ADDED IN THE INTERVAL TO PREVENT TIMER RUNOUT.

THE VARIATION IN COMMANDS CONTAINED IN SEQUENCE NO. 108 AS ASSEMBLED BY THE C + C COMPUTER PROGRAM IS DUE TO [1] AVAILABLE OR DESIRED EQUIPMENT AT A TRACKING STATION, [2] TIME DURATION OF THE STATION PASS AND [3] STATION OVERLAP OF THE TT + C CONES.

STATION OBSCURA-
FOR POGO - DEFINE AZIMUTHS [175 - 250] WHERE PPD ON IS DELAYED TO 6 DEGRREE CONE ENTRY.
FOR ALL - WHEN PPD IS ON, TM AND PPD SHOULD BE TURNED OFF AT 2 DEGREE EXIT. WHEN PPD IS OFF, TM SHOULD BE TURNED OFF AT ZERO DEGREE EXIT.

SEQUENCE NO. 107 - SPEC STAT PASS
NO. 109 - SPEC STAT PASS - REC
NO. 110 - VARIABLE STAT PASS [C+]
NO. 111 - VARIABLE STAT PASS [C-]

USAGE - IN THE NORMAL FUNCTIONING OF THE C+C COMPUTER PROGRAMS CERTAIN CRITERIA RESULT IN THE DELETION OF THE NORMAL ASSEMBLY OF STATION CONTACTS. IT IS SOMETIMES DESIRABLE TO HAVE THESE CONTACTS ASSEMBLED. THESE SEQUENCES ALLOW THE C.G. [COMMAND GENERATOR] TO -HAND SPEC- THE DESIRED STATION CONTACT.

SEQUENCE 107 - SPEC STAT PASS

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 90.0	201	T+R2-S+C-CP+6R	3	T+T ON,CP+
+ 30.0	213	T+R2-S+C+CP+6R	2	PPD ON
+345.0	291	TIMER RESET	4	KEEP REC.ON
DT + 0.0	206	T-R2-S-C-CP+6R	1	TT+C OFF

SEQUENCE 109 - SPEC STAT PASS-REC

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 90.0	203	T+R2+S+C-CP+6R	3	T+T ON PLAYBK ON
+ 30.0	217	T+R2+S+C+CP+6R	2	PPD ON
+345.0	291	TIMER RESET	4	KEEP REC.ON
DT + 0.0	206	T-R2-S-C-CP+6R	1	TT+C OFF

SEQUENCE 110 - VARIABLE STAT CONTACT [C+]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 90.0	203	T+R2+S+C-CP+6R	4	T+T ON,CP+
+ 30.0	217	T+R2+S+C+CP+6R	2	PPD ON
+345.0	291	TIMER RESET	3	KEEP REC.ON
DT + 0.0	211	T-R2-S-C-CP-6R	1	TT+C OFF,CP-

SEQUENCE 111 - VARIABLE STAT CONTACT [C-]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 90.0	201	T+R2-S+C-CP+6R	2	T+T ON,CP+ PPD OFF
+225.0	291	TIMER RESET	3	KEEP REC.ON
DT + 0.0	211	T-R2-S-C-CP-6R	1	TT+C OFF,CP-

SEQUENCE NO. 112 - PR RECORD

USAGE - THIS SEQUENCE IS USED TO RECORD A PR FUNCTION. THE PR MODE IS COMMANDED FOR 180 SECONDS WITH 900 SECONDS BETWEEN EACH PR COMMAND. THE NUMBER OF COMMAND PAIRS [CMD NOS. 267 AND 286] MAY BE REDUCED BY OMITTING THE COMMAND PAIRS STARTING WITH THE HIGHEST LOAD ORDER.

SEQUENCE 112 - PR RECORD

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+ 0.0	267	CPB R1+PR CP-YC PC RC	2	PR
+ 180.0	286	CPB R1-PO CP-YC PC RC	1	PO
+ 900.0	267	CPB R1+PR CP-YC PC RC	4	PR
+1080.0	286	CPB R1-PO CP-YC PC RC	3	PO
+1800.0	267	CPB R1+PR CP-YC PC RC	6	PR
+1980.0	286	CPB R1-PO CP-YC PC RC	5	PO
+2700.0	267	CPB R1+PR CP-YC PC RC	8	PR
+2880.0	286	CPB R1-PO CP-YC PC RC	7	PO
+3600.0	267	CPB R1+PR CP-YC PC RC	10	PR
+3780.0	286	CPB R1-PO CP-YC PC RC	9	PO

SEQUENCE NO. 114 - CYCLE RECORDER
NO. 115 - IR RECORD [2]
NO. 116 - IR RECORD [9.5]
NO. 117 - IR RECORD [13]
NO. 118 - ORBITAL RECORD P77
NO. 119 - RECORD CURRENT [2]

USAGE - SV STABLE

TO ACCUMULATE ENVIRONMENTAL DATA THROUGHOUT CERTAIN PORTIONS OF THE MISSION [WHOLE REVS. OR PORTIONS THEREOF]. CHOICE OF VARIOUS AMOUNTS OF RECORDING TIME IS POSSIBLE. THIS PERMITS SATISFACTORY SAMPLING PERIODS FOR DETAILED POST FLIGHT ANALYSIS.

SEQUENCE 114 - CYCLE RECORDER

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS	
+ 0.0	284	CPB R1+PO CP+YC PC RC	3	REC.ON,CP+,CPB	
+ 25.0	286	CPB R1-PO CP-YC PC RC	1	REC.OFF,CP-	*
+ 26.0	190	T-R2-S-C-CP-CD-	2	CD-	*
+ 270.0	284	CPB R1+PO CP+YC PC RC	6	REC.ON,CP+	*
+ 283.0	286	CPB R1-PO CP-YC PC RC	4	REC.OFF,CP-	*
+ 284.0	190	T-R2-S-C-CP-CD-	5	CD-	*
+ 540.0	284	CPB R1+PO CP+YC PC RC	9	REC.ON,CP+	*
+ 553.0	286	CPB R1-PO CP-YC PC RC	7	REC.OFF,CP-	*
+ 554.0	190	T-R2-S-C-CP-CD-	8	CD-	*
+ 810.0	284	CPB R1+PO CP+YC PC RC	12	REC.ON,CP+	*
+ 823.0	286	CPB R1-PO CP-YC PC RC	10	REC.OFF,CP-	*
+ 824.0	190	T-R2-S-C-CP-CD-	11	CD-	*
+1080.0	284	CPB R1+PO CP+YC PC RC	15	REC.ON,CP+	*
+1093.0	286	CPB R1-PO CP-YC PC RC	13	REC.OFF,CP-	*
+1094.0	190	T-R2-S-C-CP-CD-	14	CD-	*
+1350.0	284	CPB R1+PO CP+YC PC RC	18	REC.ON,CP+	*
+1379.0	286	CPB R1-PO CP-YC PC RC	16	REC.OFF,CP-	*
+1380.0	190	T-R2-S-C-CP-CD-	17	CD-	*
+1620.0	284	CPB R1+PO CP+YC PC RC	21	REC.ON,CP+	*
+1636.0	286	CPB R1-PO CP-YC PC RC	19	REC.OFF,CP-	*
+1637.0	190	T-R2-S-C-CP-CD-	20	CD-	*
+1890.0	284	CPB R1+PO CP+YC PC RC	24	REC.ON,CP+	*
+1906.0	286	CPB R1-PO CP-YC PC RC	22	REC.OFF,CP-	*
+1907.0	190	T-R2-S-C-CP-CD-	23	CD-	*
+2160.0	284	CPB R1+PO CP+YC PC RC	27	REC.ON,CP+	*
+2176.0	286	CPB R1-PO CP-YC PC RC	25	REC.OFF,CP-	*
+2177.0	190	T-R2-S-C-CP-CD-	26	CD-	*
+2430.0	284	CPB R1+PO CP+YC PC RC	30	REC.ON,CP+	*
+2446.0	286	CPB R1-PO CP-YC PC RC	28	REC.OFF,CP-	*
+2447.0	190	T-R2-S-C-CP-CD-	29	CD-	*

THE ABOVE SEQUENCE PROVIDES RECORDING PERIODS OF FROM 13 SECONDS TO 29 SECONDS DURATION. THE SEQUENCE REQUIRES 18.5 PERCENT OF THE RECORDING CAPABILITY AND 0.41 REVS. *

SEQUENCE 115 - IR RECORD [2]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 10.3	385	IR+I+TM CH-AC+	9	IR PREAMP
- 10.0	281	CPB R1+PO CP-YC PC RC	2	REC.ON
+ 20.0	286	CPB R1-PO CP-YC PC RC	3	REC.OFF
+165.0	281	CPB R1+PO CP-YC PC RC	4	REC.ON
+185.0	286	CPB R1-PO CP-YC PC RC	8	REC.OFF
+535.0	281	CPB R1+PO CP-YC PC RC	7	REC.ON
+555.0	286	CPB R1-PO CP-YC PC RC	6	REC.OFF
+710.0	281	CPB R1+PO CP-YC PC RC	5	REC.ON
+770.0	286	CPB R1-PO CP-YC PC RC	1	REC.OFF
+770.3	392	IR-I-TM CH-AC+	10	TOTAL I

THE ABOVE SEQUENCE PROVIDES IR RECORDING AND USES 14 PERCENT OF THE TOTAL RECORD TIME. THE SEQUENCE REQUIRES 0.14 REVS.

SEQUENCE 116 - IR RECORD [9.5]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 30.3	385	IR+I+TM CH-AC+	7	IR PREAMP
- 30.0	281	CPB R1+PO CP-YC PC RC	6	REC.ON
+120.0	286	CPB R1-PO CP-YC PC RC	5	REC.OFF
+225.0	281	CPB R1+PO CP-YC PC RC	4	REC.ON
+495.0	286	CPB R1-PO CP-YC PC RC	3	REC.OFF
+690.0	281	CPB R1+PO CP-YC PC RC	2	REC.ON
+840.0	286	CPB R1-PO CP-YC PC RC	1	REC.OFF
+840.3	392	IR-I-TM CH-AC+	8	TOTAL I

THE ABOVE SEQUENCE PROVIDES IR RECORDING AND USES 62 PERCENT OF THE TOTAL RECORD TIME. THE SEQUENCE REQUIRES 0.16 REVS.
THIS SEQUENCE MUST BE USED IN CONJUNCTION WITH SEQUENCE 106-ACQUIRE FWD.

SEQUENCE 117 - IR RECORD [13]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 30.3	385	IR+I+TM CH-AC+	9	IR PREAMP
- 30.0	281	CPB R1+PO CP-YC PC RC	2	REC.ON
+150.0	392	IR-I-TM CH-AC+	3	TOTAL I
+170.0	399	IR-I+TM CH-AC+	4	IR PREAMP
+350.0	392	IR-I-TM CH-AC+	5	TOTAL I
+375.0	399	IR-I+TM CH-AC+	6	IR PREAMP
+555.0	392	IR-I-TM CH-AC+	7	TOTAL I
+575.0	399	IR-I+TM CH-AC+	8	IR PREAMP
+750.0	286	CPB R1-PO CP-YC PC RC	1	REC.OFF
+750.3	392	IR-I-TM CH-AC+	10	TOTAL I

THE ABOVE SEQUENCE PROVIDES 715 SECONDS OF IR RECORDING AND 65 SECONDS OF TOTAL CURRENT RECORDING AND USES 80 PERCENT OF THE RECORDER CAPABILITY. THE SEQUENCE REQUIRES 0.14 REVS.

SEQUENCE 119 - RECORD CURRENT [2]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 0.3	389	IR+I-TM CH-AC+	3	TOTAL I
+ 0.0	284	CPB R1+PO CP+YC PC RC	23	REC.ON
+ 35.0	286	CPB R1-PO CP-YC PC RC	2	REC.OFF
+ 36.0	190	T-R2-S-C-CP-CD-	1	CD-
+ 216.0	284	CPB R1+PO CP+YC PC RC	6	REC.ON,CP+
+ 256.0	286	CPB R1-PO CP-YC PC RC	5	REC.OFF,CP-
+ 257.0	190	T-R2-S-C-CP-CD-	4	CD-
+ 437.0	284	CPB R1+PO CP+YC PC RC	9	REC.ON,CP+
+ 482.0	286	CPB R1-PO CP-YC PC RC	8	REC.OFF,CP-
+ 483.0	190	T-R2-S-C-CP-CD-	7	CD-
+ 663.0	284	CPB R1+PO CP+YC PC RC	12	REC.ON,CP+
+ 713.0	286	CPB R1-PO CP-YC PC RC	11	REC.OFF,CP-
+ 714.0	190	T-R2-S-C-CP-CD-	10	CD-
+ 894.0	253	CPB R1+PO CP+YC PC RF	15	FINE DB
+ 895.0	284	CPB R1+PO CP+YC PC RC	16	STAB.INIT
+ 939.0	286	CPB R1-PO CP-YC PC RC	14	REC.OFF,CP-
+ 940.0	190	T-R2-S-C-CP-CD-	13	CD-
+1360.0	284	CPB R1+PO CP+YC PC RC	19	REC.ON,CP+
+1400.0	286	CPB R1-PO CP-YC PC RC	18	REC.OFF,CP-
+1401.0	190	T-R2-S-C-CP-CD-	17	CD-
+1581.0	284	CPB R1+PO CP+YC PC RC	22	REC.ON,CP+
+1616.0	286	CPB R1-PO CP-YC PC RC	21	REC.OFF,CP-
+1617.0	190	T-R2-S-C-CP-CD-	20	CD-

THE ABOVE SEQUENCE PROVIDES SEVEN [7] RECORDED SAMPLES OF TOTAL CURRENT. COMMAND 190 IS USED TO TURN THE C.D. OFF ONE SECOND AFTER THE END OF EACH RECORDING PERIOD BECAUSE OF C.D. VOLTAGE THERMO CONSIDERATIONS.

SEQUENCE NO. 121 - TC TEST

USAGE - THIS SEQUENCE IS FOR A FLIGHT EXPERIMENT WHICH WILL BE PERFORMED AT VARIOUS TIMES DURING THE MISSION.

SEQUENCE 121 - TC TEST

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 1.0	284	CPB R1+PO CP+YC PC RC	3	REC.ON,CP+
+ 0.0	339	R1+YLC PLC RLC IDE-ABE-TC+TQ-RT-CH-0	4	TC+
+ 30.0	487	64 040.0-06.4L14	5	ROLL - 6.4L
+120.0	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	1	TC-
+121.0	286	CPB R1-PO CP-YC PC RC	2	REC.OFF,CP-

SEQUENCE NO. 122 - CP TEST [AFTER PASS]

USAGE - THIS SEQUENCE IS USED TO CHECK THE CP FUNCTION AFTER A STATION PASS.

SEQUENCE 122 - CP TEST [AFTER PASS]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+ 0.0	285	CPB R1-PO CP+YC PC RC	3	CP+
+ 0.5	494	64 015.5-06.4L10	2	ROLL - 6.4L
+25.8	286	CPB R1-PO CP-YC PC RC	1	CP-

SEQUENCE NO. 123 - CP TEST [MID PASS]

USAGE - THIS SEQUENCE IS USED TO CHECK THE CP FUNCTION DURING A STATION PASS.

SEQUENCE 123 - CP TEST [MID PASS]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-0.5	285	CPB R1-PO CP+YC PC RC	2	CP+
+0.0	493	01 001.5-06.4L10	3	ROLL - 6.4L
+2.5	286	CPB R1-PO CP-YC PC RC	1	CP-

SEQUENCE NO. 124 - CT INITIATE

USAGE - THIS SEQUENCE PRODUCES A COMPUTER TIMER BYPASS IN REAL TIME OVER A STATION DURING THE SOLO PORTION OF THE MISSION.

SEQUENCE 124 - CT INITIATE

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+ 0.0	284	CPB R1+PO CP+YC PC RC	4	CPB,CP+,REC.ON
+ 10.0	383	IR+I-TM CH-AC+CT	5	CT+
+ 31.0	402	PZ EP+IR+I-TM CH-AC+E-	6	D5 INIT.
+ 40.0	277	CPA R1+PO CP+YC PC RC	2	CPA
+ 70.0	284	CPB R1+PO CP+YC PC RC	3	CPB
+ 71.0	402	PZ EP+IR+I-TM CH-AC+E-	7	D5 INIT.
+100.0	286	CPB R1-PO CP-YC PC RC	1	REC.OFF,CP-
+101.0	402	PZ EP+IR+I-TM CH-AC+E-	8	D5 INIT.

SEQUENCE NO. 125 - CPA/B EXERCISE [30/30]

USAGE - THIS SEQUENCE PROVIDES COMPUTER PHASE SWITCHING, AND IS TO BE NORMALLY PRECEEDED BY SEQUENCE 124. IF CT HAS NOT EXECUTED, SEQUENCE 124 SHOULD END NO CLOSER THAN 30 SECONDS PRIOR TO THIS SEQUENCE.

SEQUENCE 125 - CPA/B EXERCISE [30/30]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 0.3	389	IR+I-TM CH-AC+	13	TOTAL I
+ 0.0	284	CPB R1+PO CP+YC PC RC	12	REC.ON
+ 10.0	277	CPA R1+PO CP+YC PC RC	11	CPA,CP+
+ 31.0	402	PZ EP+IR+I-TM CH-AC+E-	14	D5 INIT.
+ 40.0	284	CPB R1+PO CP+YC PC RC	10	CPB
+ 41.0	402	PZ EP+IR+I-TM CH-AC+E-	15	D5 INIT.
+ 70.0	277	CPA R1+PO CP+YC PC RC	9	CPA
+ 71.0	402	PZ EP+IR+I-TM CH-AC+E-	16	D5 INIT.
+100.0	284	CPB R1+PO CP+YC PC RC	8	CPB
+101.0	402	PZ EP+IR+I-TM CH-AC+E-	17	D5 INIT.
+130.0	277	CPA R1+PO CP+YC PC RC	7	CPA
+131.0	402	PZ EP+IR+I-TM CH-AC+E-	18	D5 INIT.
+160.0	284	CPB R1+PO CP+YC PC RC	6	CPB
+161.0	402	PZ EP+IR+I-TM CH-AC+E-	19	D5 INIT.
+190.0	277	CPA R1+PO CP+YC PC RC	5	CPA
+191.0	402	PZ EP+IR+I-TM CH-AC+E-	20	D5 INIT.
+220.0	284	CPB R1+PO CP+YC PC RC	4	CPB
+221.0	402	PZ EP+IR+I-TM CH-AC+E-	21	D5 INIT.
+250.0	277	CPA R1+PO CP+YC PC RC	3	CPA
+251.0	402	PZ EP+IR+I-TM CH-AC+E-	22	D5 INIT.
+280.0	284	CPB R1+PO CP+YC PC RC	2	CPB
+281.0	402	PZ EP+IR+I-TM CH-AC+E-	23	D5 INIT.
+310.0	286	CPB R1-PO CP-YC PC RC	1	REC.OFF,CP-
+311.0	402	PZ EP+IR+I-TM CH-AC+E-	24	D5 INIT.

SEQUENCE NO. 126 - HEALTH CHECK

USAGE - THIS SEQUENCE IS TO BE EXECUTED DURING A STATION PASS. IT PERMITS REAL TIME ANALYSIS OF THE OPERABILITY OF THE STABILIZATION SUBSYSTEM. THIS SEQUENCE IS NOT RECORDED.
THE SEQUENCE TERMINATES WITH CP+ WHICH WILL GO TO CP- WHEN P.C. TIMES OUT.

SEQUENCE 126 - HEALTH CHECK

TIME TAG	CMD NO	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+ 0.0	285	CPB R1-PO CP+YC PC RC	18	CPB,CP+
+ 30.0	351	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-1	2	RT+,1
+ 40.0	480	01 019.0+00.0L14	3	ROLL + 0.0L
+ 60.0	349	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-2	4	2
+ 67.0	477	10 018.0+00.0L03	5	
+ 86.0	351	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-1	6	1
+ 95.0	476	19 017.0+00.0L34	7	
+113.0	349	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-2	8	2
+117.0	474	28 016.0+00.0L03	9	
+134.0	351	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-1	10	1
+138.0	473	37 015.0+00.0L14	11	
+154.0	349	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-2	12	2
+158.0	472	46 014.0+00.0L33	13	
+173.0	351	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-1	14	1
+177.0	471	55 013.0+00.0L14	15	
+191.0	349	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-2	16	2
+195.0	469	64 012.0+00.0L13	17	
+215.0	334	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-2	1	RT-

SEQUENCE NO. 127 - FA EXERCISE

USAGE - THIS SEQUENCE IS USED TO EXERCISE THE FA FUNCTION FOR A DELTA TIME. THIS SEQUENCE IS RECORDED.

SEQUENCE 127 - FA EXERCISE

TIME TAG	CMD NO	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-10.0	284	CPB R1+PO CP+YC PC RC	4	CP+
- 0.3	339	R1+YLC PLC RLC IDE-ABE-TC+TQ-RT-CH-0	5	TC+
+ 0.0	374	IR+FA I-TM CH-AC+	6	FA
DT+ 0.0	339	R1+YLC PLC RLC IDE-ABE-TC+TQ-RT-CH-0	1	TC+
DT+ 0.3	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	2	TC-
DT+10.0	286	CPB R1-PO CP-YC PC RC	3	CP-

SEQUENCE NO. 128 - SECURE WORD CHECK - R2 MODE

USAGE - THIS SEQUENCE VERIFIES [BY COMMAND DECODER BUSY SIGNAL BLOCKING OF C+ AND R2- EXECUTION] DSPC 1 SECURE COMMAND CAPABILITY.

SEQUENCE 128 - SECURE WORD CHECK [R2+]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+ 0.0	299	SEC CHK	3	SECURE CHK
+ 0.1	213	T+R2-S+C+CP+6R	2	PPD ON
+10.0	217	T+R2+S+C+CP+6R	1	PLAYBK ON

USAGE - THIS SEQUENCE IS USED TO ADVANCE THE SECURE COUNT AT SPECIFIC TIMES DURING THE FLIGHT. ZERO TIME IS TIME OF COMMAND TO BE BLOCKED.

SEQUENCE 130 - PPD BLINK AND BLOCK

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-180.0	237	T-R2-S-C+CP-6R	3	PPD ON
-179.7	211	T-R2-S-C-CP-6R	2	PPD OFF
- 0.2	485	01 000.5+00.0L10 OVERRIDE	1	ROLL + 0.0L

SEQUENCE NO. 131 - YAW AROUND TO REVERSE

USAGE - SV STABLE, FLY FORWARD.

COARSE LIMIT CYCLE, APPLY YAWING TORQUE, GIVE -FLY REVERSE- COMMAND. SV ORIENTED IN FLY REVERSE CONDITION. SETTLING TIME OF APPROX. 1970 SEC. TO COARSE DEADBAND. THIS SEQUENCE IS TO BE USED ONLY WITH THE SV IN A FLY FORWARD STATE. PORTIONS OF THIS SEQUENCE ARE RECORDED.

SEQUENCE 131 - YAW AROUND TO REV

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 28.0	482	01 000.1+00.0L14	1	ROLL + 0.0L
- 10.0	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	4	REC.ON STAB.INIT
+ 0.0	322	R1+YLC PLC RLC IDE-ABE-TC-TQ+RT-CH-0	5	YAW TORQUE
+ 90.0	286	CPB R1-PO CP-YC PC RC	6	REC.OFF
+440.0	281	CPB R1+PO CP-YC PC RC	7	REC.ON
+450.0	314	R1+YLC PLC RLC IDE-ABE-TC-TQ-F-RT-CH-0	2	FLY REV
+540.0	313	R1-YLC PLC RLC IDE-ABE-TC-TQ-F-RT-CH-0	3	REC.OFF

SEQUENCE NO. 132 - YAW AROUND TO FORWARD

USAGE - SV STABLE, FLY REVERSE.

COARSE LIMIT CYCLE , APPLY YAWING TORQUE, GIVE -FLY FORWARD- COMMAND. SV ORIENTED IN FLY FORWARD CONDITION. SETTLING TIME OF APPROX. 1970 SEC. TO COARSE DEADBAND. THIS SEQUENCE IS TO BE USED ONLY WITH THE SV IN A FLY REVERSE STATE. PORTIONS OF THIS SEQUENCE ARE RECORDED.

SEQUENCE 132 - YAW AROUND TO FWD

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 28.0	482	01 000.1+00.0L14	1	ROLL + 0.0L
- 10.0	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	4	REC.ON STAB.INIT
+ 0.0	322	R1+YLC PLC RLC IDE-ABE-TC-TQ+RT-CH-0	5	YAW TORQUE
+ 90.0	286	CPB R1-PO CP-YC PC RC	6	REC.OFF
+440.0	281	CPB R1+PO CP-YC PC RC	7	REC.ON
+450.0	312	R1+YLC PLC RLC IDE-ABE-TC-F+TQ-RT-CH-0	2	FLY FWD
+540.0	310	R1-YLC PLC RLC IDE-ABE-TC-F+TQ-RT-CH-0	3	REC.OFF

SEQUENCE NO. 133 - PITCH DOWN

USAGE - SV IS TO BE PITCHED DOWN FROM A HORIZONTAL CONDITION [EITHER FLY FORWARD OR FLY REVERSE].

THE SEQUENCE REQUIRES 480 SECONDS, INCLUDING SETTLING TIME. THIS SEQUENCE IS NOT RECORDED. SV IS LEFT IN A PITCH-DOWN CONDITION WITH PREDAC BYPASS. THE PITCH AXIS IS LEFT IN LOW COARSE AND SHOULD REMAIN IN EITHER LOW COARSE OR LOW FINE UNTIL THE VEHICLE IS RETURNED TO PITCH ZERO.

SEQUENCE 133 - DOWN

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-180.0	400	BY IR+I-TM CH-AC+	1	PREDAC BY+
+179.0	482	01 000.1+00.0L14	5	STAB.INIT
- 10.0	338	R1-YLC PHC RLC IDE-ABE-TC-TQ-RT-CH-0	2	STAB.INIT
+ 0.0	386	PD IR+I-TM CH-AC+	3	PITCH DOWN
+300.0	323	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	4	STAB.INIT

SEQUENCE NO. 134 - PITCH ZERO

USAGE - SV IS TO BE BROUGHT HORIZONTAL FROM A PITCH-DOWN CONDITION [EITHER FLY FORWARD OR FLY REVERSE].

THE SEQUENCE REQUIRES 210 SECONDS, AND IS RECORDED IN ITS ENTIRETY. SV IS LEFT IN A PITCH ZERO CONDITION WITH ALL AXES IN COARSE LIMIT CYCLE.

SEQUENCE 134 - UP

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
- 10.0	326	R1+YLC PHC RLC IDE-ABE-TC-TQ-RT-CH-0	2	REC.ON
- 9.7	482	01 000.1+00.0L14	4	STAB.INIT
+ 0.0	397	PZ IR+I-TM CH-AC+	3	PITCH ZERO
+200.0	323	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	1	REC.OFF

SEQUENCE NO. 135 - AC BACKUP SPECIAL

USAGE - THIS SEQUENCE IS USED IN THE SAME MANNER AS IS SEQUENCE 137 [AC BACKUP] EXCEPT THIS SEQUENCE SHOULD BE USED TO INITIALIZE THE STABILIZATION SYSTEM UNDER CONDITIONS WHERE IT IS NOT PERFORMING NORMALLY, BUT THE CAUSE IS NOT KNOWN.

SEQUENCE 135 - AC BACKUP SPECIAL

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+ 0.0	281	CPB R1+PO CP-YC PC RC	9	REC.ON
+ 0.3	482	01 000.1+00.0L14	10	ROLL + 0.0L
+ 0.6	397	PZ IR+I-TM CH-AC+	8	PITCH ZERO PREDAC RY-
+ 0.9	345	R1+YLC PLC RLC IDF+ABE-TC-TQ-RT-CH-0	7	STAB.INIT IR- ENAB.
+ 1.2	381	RPU IR-I+TM CH-AC+	6	RPU,IR OFF
+ 1.5	385	IR+I+TM CH-AC+	5	IR ON
+ 71.0	397	PZ IR+I-TM CH-AC+	4	PITCH ZERO
+100.0	312	R1+YLC PLC RLC IDF-ABE-TC-F+TQ-RT-CH-0	3	FLY FWD IR- DISAB.
+101.0	482	01 000.1+00.0L14	2	STAB.INIT
+150.0	286	CPB R1-PO CP-YC PC RC	1	REC.OFF

SEQUENCE NO. 136 - ROLL MATRIX

USAGE - SV STABLE, FORWARD

THIS SEQUENCE IS DESIGNED TO BE USED SOON AFTER INJECTION/AGENA SEPARATION. IT WILL PERMIT [FROM AUGIE DATA AND REAL TIME MONITORING] A RAPID DIAGNOSTIC ANALYSIS OF THE OPERABILITY OF THE STABILIZATION SUBSYSTEM. THIS SEQUENCE IS NOT RECORDED.
IT SHOULD BE NOTED THAT CP+ IS COMMANDED FOR THE ENTIRE DURATION OF THE SEQUENCE AND REMAINS IN THIS STATE AT THE CONCLUSION OF THE SEQUENCE.

SEQUENCE 136 - ROLL MATRIX - 1A

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+ 0.0	288	CPA R1-PO CP+YC PC RC	2	CPA,CP+
+ 31.0	402	PZ EP+IR+I-TM CH-AC+E-	10	D5 INIT.
+ 35.0	285	CPB R1-PO CP+YC PC RC	9	CPB
+ 60.0	324	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-0	3	RT+
+ 66.0	402	PZ EP+IR+I-TM CH-AC+E-	11	D5 INIT.
+ 70.0	468	01 004.0-44.7H13	8	ROLL -44.7H
+ 88.0	467	01 006.0+45.4H13	7	ROLL +45.4H
+122.0	466	01 008.0+00.0M13	4	ROLL + 0.0M
+159.0	465	01 006.0+02.1L13	5	ROLL + 2.1L
+180.0	456	01/01 10.1+04.3M+00.0L13 [03.5/03.0]	6	ROLL + 4.3M
+215.0	323	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	1	RT-

SEQUENCE NO. 137 - AC BACKUP

USAGE - THE INADVERTENT TURN OFF OF THE COMMAND DECODER [IN THE REAL TIME MODE], AND SUBSEQUENT TURN ON IN THE CD BUSY MODE, CREATES CERTAIN UNDESIRABLE COMMAND CONDITIONS. THIS SEQUENCE IS DESIGNED FOR TC HAND SPEC/NORMAL ASSEMBLY INSERTION IN THE COMMAND LOAD TO PERIODICALLY RE-INITIALIZE THE VEHICLE. THE TIME TAG FOR THIS SEQUENCE SHOULD BE SUCH THAT EXECUTION WILL FOLLOW THE LAST -POWER ON ALERT- OF A PREVIOUS OPERATION BY A TIME DIFFERENCE SLIGHTLY GREATER THAN THE TIMER PERIOD. IN OTHER WORDS, THE CLOSEST THAT THIS RE-INITIALIZING SHOULD OCCUR TO A CHRONOLOGICALLY PREVIOUS COMMAND WOULD BE 6 OR 12 MINUTES PLUC P.C. TIMER TOLERANCE [DEPENDING ON TIMER MODE]. THIS WILL INSURE THAT ANY MALFUNCTION RESULTING IN A COMMAND DECODER BUSY CONDITION WILL HAV BEEN ALLEVIATED BY POWER CONTROLLER TIMER RUN OUT.

THIS SEQUENCE, WHICH IS RECORDED, SHOULD ACCOMPANY EACH OF THE -CANNED- ROLL AND VEHICLE -HEALTH CHECK- EXERCISES.

SEQUENCE 137 - AC BACKUP

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+ 0.0	267	CPB R1+PR CP-YC PC RC	3	CPB,PR,REC.ON
+ 1.0	262	CPB R1+PO CP+YF PF RF	1	PO,FINE DB,CP+
+ 1.3	484	01 000.1-06.4L14	2	ROLL - 6.4L
+30.0	286	CPB R1-PO CP-YC PC RC	4	REC.OFF STAR.INIT

SEQUENCE NO. 138 - OCV BLEED-PRES

USAGE - SV STABLE

PRIOR TO ACTIVATION OF OCV ENGINES, ANY TRAPPED GAS IN THE MANIFOLDS MUST BE -BLED OFF-. ENGINES ARE TURNED ON WITH THE CORRECT SECURE KEY, TURNED OFF, AND HOT GAS PROPELLANT TANKS ARE PRESSURIZED. ENGINES ARE NOW READY FOR ORBIT ADJUST OPERATION. ENGINES SHOULD NOT BE IGNITED ANY SOONER THAN 30 SECONDS FOLLOWING COMMAND NO. 388. DO NOT ATTEMPT TO BLEED TWICE.

SEQUENCE 138 - OCV BLEED-PRES

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+0.0	300	E1+E2+	3	ENGS.ON,SECURE
+2.0	371	IR+I-TM CH+AC+E-	1	ENGS.OFF
+2.5	371	IR+I-TM CH+AC+E-	4	ENGS.OFF
+3.0	388	PTP IR+I-TM CH+AC+E-	2	PRESS.ENG.

SEQUENCE NO. 139 - OCV BLEED

USAGE - SV STABLE

SAME AS SEQUENCE 138 EXCEPT HOT GAS PROPELLANT TANKS ARE NOT PRESSURIZED. A BACKUP PRESSURIZATION COMMAND IS CONTAINED IN ORBIT ADJUST SEQUENCES AND OCV DEBOOST SEQUENCES. SEQUENCE NUMBER 138 OR COMMAND NUMBER 388 SHOULD STILL BE EXERCISED PRIOR TO ANY ENGINE ON COMMAND. DO NOT ATTEMPT TO BLEED ENGINES FOLLOWING A PTP COMMAND.

SEQUENCE 139 - OCV BLEED

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+0.0	300	E1+E2+	2	ENGS.ON,SECURE
+2.0	371	IR+I-TM CH+AC+E-	1	ENGS.OFF

SEQUENCE NO. 140, 141, 142 - ORBIT ADJUSTS 1,2, AND 3

USAGE - SV STABLE, FLY FWD. POSITIVE AND/OR NEGATIVE IMPULSE TO ORBIT. ALL SEQUENCES ACTIVATE OCV ENGINES WHEN CORRECT SECURE KEY IS GIVEN. HIGH THRUST NOZZLES ARE ACTIVATED WITH PITCH IN FINE LIMIT CYCLE AND YAW AND ROLL IN COARSE LIMIT CYCLE DURING IMPULSE PERIOD. AFTER FINAL ENGINE CUTOFF THE VEHICLE IS RETURNED TO LOW THRUST WITH YAW, PITCH, AND ROLL IN COARSE LIMIT CYCLE.
THE VEHICLE IS LEFT IN A FLY FORWARD CONDITION IN ALL CASES.
THE FOLLOWING THRUST COMBINATIONS ARE FORMED USING SEQUENCES AS NOTED-

THRUST	SEQ.
+-	141 - 142
++	141 - 141
--	140
-+	142 - 141

IN SEQUENCE 140 RECORDING COULD OCCUR FOR OVER 900 SECONDS. TO PREVENT RECORDING OVER DATA, ADDITIONAL COMMANDS SHOULD BE GENERATED TO ASSURE THAT THIS UNDESIRABLE CONDITION DOES NOT EXIST. THE YAW AROUND PORTION OF SEQUENCE 142 IS NOT RECORDED IN ITS ENTIRETY.
WHEN ASSEMBLING ORBIT ADJUST SEQUENCES A REDUNDANT ENGINE OFF COMMAND (371) IS TO BE PLACED IN A SEPARATE BLOCK TO BE LOADED IN ANOTHER DELAY LINE, TIME BUMPED 3.0 SECONDS. FOR EMERGENCY ORBIT ADJUSTS USE COMMAND 300 (E1+E2+).

SEQUENCE 140 - ORBIT ADJUST-1

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-1388.0	482	01 000.1+00.0L14	1	ROLL + 0.0L
-1370.0	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	13	REC.ON
-1360.0	322	R1+YLC PLC RLC IDE-ABE-TC-TQ+RT-CH-0	4	YAW TORQUE
-1260.0	286	CPB R1-PO CP-YC PC RC	14	REC.OFF
- 940.0	281	CPB R1+PO CP-YC PC RC	9	REC.ON
- 910.0	314	R1+YLC PLC RLC IDE-ABE-TC-TQ-F-RT-CH-0	3	FLY REV
- 900.0	388	PTP IR+I-TM CH+AC+E-	19	PRESS.ENG.
- 880.0	313	R1-YLC PLC RLC IDE-ABE-TC-TQ-F-RT-CH-0	15	REC.OFF
- 2.0	333	R1+YHC PHF RHC IDE-ABE-TC-TQ-RT-CH+0	7	STAB.INIT REC.ON,CH+
+ 0.0	303	E2+	8	ENGS.ON,SECURE
DT1+ 0.0	371	IR+I-TM CH+AC+E-	6	ENGS.OFF
DT1+ 3.0	371	IR+I-TM CH+AC+E-	17	ENGS.OFF
DT1+ 60.0	323	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	16	CH-,REC.OFF STAB.INIT
+T2- 2.0	333	R1+YHC PHF RHC IDE-ABE-TC-TQ-RT-CH+0	10	REC.ON,CH+ STAB.INIT
+T2+ 0.0	303	E2+	12	ENGS.ON,SECURE
DT2+ 0.0	371	IR+I-TM CH+AC+E-	11	ENGS.OFF
DT2+ 3.0	371	IR+I-TM CH+AC+E-	18	ENGS.OFF
DT2+ 60.0	322	R1+YLC PLC RLC IDE-ABE-TC-TQ+RT-CH-0	5	YAW TORQUE,CH- STAB.INIT
DT2+ 170.0	286	CPB R1-PO CP-YC PC RC	20	REC.OFF
DT2+ 480.0	281	CPB R1+PO CP-YC PC RC	21	REC.ON
DT2+ 510.0	312	R1+YLC PLC RLC IDE-ABE-TC-F+TQ-RT-CH-0	2	FLY FWD
DT2+ 540.0	286	CPB R1-PO CP-YC PC RC	22	REC.OFF
DT2+ 541.0	484	01 000.1-06.4L14	23	ROLL - 6.4L

SEQUENCE 141 - ORBIT ADJUST-2

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-35.0	333	R1+YHC PHF RHC IDE-ABE-TC-TQ-RT-CH+0	2	STAB.INIT REC.ON,CH+
-30.0	388	PTP IR+I-TM CH+AC+E-	6	PRESS.ENG.
+ 0.0	303	E2+	4	ENGS.ON,SECURE
DT+ 0.0	371	IR+I-TM CH+AC+E-	1	ENGS.OFF
DT+ 3.0	371	IR+I-TM CH+AC+E-	5	ENGS.OFF
DT+60.0	323	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	3	CH-,REC.OFF STAB.INIT

SEQUENCE 142 - ORBIT ADJUST-3

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-488.0	482	01 000.1+00.0L14	1	ROLL + 0.0L
-470.0	281	CPB R1+PO CP-YC PC RC	12	REC.ON
-460.0	322	R1+YLC PLC RLC IDE-ABE-TC-TQ+RT-CH-0	4	YAW TORQUE
-360.0	286	CPB R1-PO CP-YC PC RC	10	REC.OFF
- 40.0	281	CPB R1+PO CP-YC PC RC	7	REC.ON
- 30.0	388	PTP IR+I-TM CH+AC+E-	11	PRESS.ENG.
- 10.0	347	R1+YHC PHF RHC IDE-ABE-TC-TQ-F-RT-CH+0	3	FLY REV,CH+ STAB.INIT
+ 0.0	303	E2+	8	ENGS.ON,SECURE
DT+ 0.0	371	IR+I-TM CH+AC+E-	6	ENGS.OFF
DT+ 3.0	371	IR+I-TM CH+AC+E-	9	ENGS.OFF
DT+ 60.0	322	R1+YLC PLC RLC IDE-ABE-TC-TQ+RT-CH-0	5	YAW TORQUE,CH-
DT+200.0	286	CPB R1-PO CP-YC PC RC	13	REC.OFF
DT+480.0	281	CPB R1+PO CP-YC PC RC	15	REC.ON
DT+510.0	312	R1+YLC PLC RLC IDE-ABE-TC-F+TQ-RT-CH-0	2	FLY FWD
DT+540.0	286	CPB R1-PO CP-YC PC RC	14	REC.OFF
DT+541.0	484	01 000.1-06.4L14	16	ROLL - 6.4L

SEQUENCE NO. 143 - GAS DEPLETION

USAGE - THIS SEQUENCE IS USED TO CHECK THE COLD GAS CONSUMPTION RATE. COMMANDS 478 AND 479 SHOULD BE CONTINUOUSLY ALTERNATED AT 3.0 SECOND INTERVALS FOR THE REQUIRED NUMBER OF MANEUVERS FOR GAS DEPLETION. THIS SEQUENCE IS TO BE EXECUTED FOLLOWING OCV DEBOOST, ENGINE BURN.

SEQUENCE 143 - GAS DEPLETION

TIME TAG	CMD NO	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+0.0	324	R1-YLF PLF RLF IDE-ABE-TC-TQ-RT+CH-0	1	
+1.0	478	01 000.1+45.4H10	2	ROLL +45.4H
+4.0	479	01 000.1-44.7H10	3	ROLL -44.7H

SEQUENCE NO. 144 - DISCON-1
NO. 145 - DISCON-2

USAGE - STABLE SV

PERFORM DISCONNECT FUNCTION PRIOR TO RV DEBOOST. DS1 ENABLE AND IR OFF DISABLE FUNCTIONS HAVE BEEN INCORPORATED. SEQUENCE 144 IS NORMALLY LOADED IN ONE DELAY LINE, SEQUENCE 145 IN ANOTHER. BACKUP SEQUENCE 145 HAS BEEN DEFINED WITH TIME TAGS WHICH ARE 0.3 SECONDS AHEAD OF SEQUENCE 144. THESE SEQUENCES ARE TO BE EXECUTED REAL TIME OVER A STATION. PLUS ONE AND MINUS ONE SECURE KEY COMMANDS ARE CONTAINED IN THESE SEQUENCES.

SEQUENCE 144 - DISCON-1

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-21.1	286	CPB R1-PO CP-YC PC RC	8	CP-
-20.0	328	R1-YLC PLC RLC IDE+ABE-TC-TQ-RT-CH+0	2	DS1 ENAB.,CH+
+ 0.0	304	DS1	3	DS1,SECURE
+ 0.3	304	DS1	5	DS1,SECURE
+ 1.5	398	IR+I-DS2 TM CH+AC+	4	DS2
+ 6.5	398	IR+I-DS2 TM CH+AC+	6	DS2
+11.5	377	IR+I-DS2 TM CH-AC+	7	CH-
+13.3	313	R1-YLC PLC RLC IDE-ABE-TC-TQ-F-RT-CH-0	1	IR- DISAB. FLY REV

SEQUENCE 145 - DISCON-2

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-20.8	286	CPB R1-PO CP-YC PC RC	7	CP-
-19.7	328	R1-YLC PLC RLC IDE+ABE-TC-TQ-RT-CH+0	2	DS1 ENAB.,CH+
+ 0.6	304	DS1	3	DS1,SECURE
+ 2.1	398	IR+I-DS2 TM CH+AC+	4	DS2
+ 6.8	398	IR+I-DS2 TM CH+AC+	5	DS2
+11.8	377	IR+I-DS2 TM CH-AC+	6	CH-
+13.6	313	R1-YLC PLC RLC IDE-ABE-TC-TQ-F-RT-CH-0	1	IR- DISAB. FLY REV

SEQUENCE NO. 146 - ALTERNATE SEPARATE

USAGE - SV IS IN A -FLY REVERSE- CONDITION. RV IS TO BE DEBOOSTED. SV STABLE.
THE SEQUENCE BEGINS 880 SECONDS BEFORE RV RETRO AND EXTENDS 610 SECONDS AFTER RV RETRO. AUTOMATIC ASSEMBLY OF A STATION PASS SEQUENCE ASSOCIATED WITH THE DEBOOST POINT SHOULD BE DELETED.

WHEN RV IS DEBOOSTED, OCV IS LEFT IN FLY-REVERSE, PITCH ZERO CONDITION. MISSING FROM THIS SEQUENCE ARE THE ACTUAL RV DEBOOST COMMANDS - EXPLAINED IN SEQUENCE NUMBER 148. ZERO TIME OF SEQUENCE IS RV RETROFIRE TIME. IN ORDER TO USE THE SAME SECURE KEY FOR THE OCV DEBOOST SEQUENCE THIS SEQUENCE DOES NOT CONTAIN A PPD ON COMMAND. THEREFORE THE OCV DEBOOST SEQUENCE [AND ANY OTHER DESIRED SEQUENCES] MUST BE LOADED AT THE SAME STATION PASS AS THE SECURE SEQUENCE 148.

SEQUENCE 146 - ALTERNATE SEPARATE

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-880.0	400	BY IR+I-TM CH-AC+	7	PREDAC BY+
-879.0	482	01 000.1+00.0L14	10	ROLL + 0.0L
-710.0	338	R1-YLC PHC RLC IDE-ABE-TC-TQ-RT-CH-0	9	STAB.INIT
-700.0	386	PD IR+I-TM CH-AC+	1	PITCH DOWN
-200.0	337	R1+YLC PLF RLC IDE-ABE-TC-TQ-RT-CH-0	6	REC.ON
+ 24.0	326	R1+YLC PHC RLC IDE-ABE-TC-TQ-RT-CH-0	2	STAB.INIT
+ 24.5	482	01 000.1+00.0L14	5	ROLL + 0.0L
+ 25.0	397	PZ IR+I-TM CH-AC+	3	PITCH ZERO PREDAC BY-
+125.0	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	8	STAB.INIT
+220.0	286	CPB R1-PO CP-YC PC RC	4	REC.OFF
+270.0	189	T+R2+S+C-CP-6R	12	PLAYBK ON
+610.0	211	T-R2-S-C-CP-6R	11	TT+C OFF

-710.0	319	R1-YHC PHC RLC IDE-ABE-TC-TQ-RT-CH-0	9	STAB.INIT
-200.0	333	R1+YHC PHF RHC IDE-ABE-TC-TQ-RT-CH+0	6	REC.ON
+ 24.0	315	R1+YHC PHC RHC IDE-ABE-TC-TQ-RT-CH-0	2	STAB.INIT
+125.0	315	R1+YHC PHC RHC IDE-ABE-TC-TQ-RT-CH-0	8	STAB.INIT

THE ABOVE [4] ALTERNATE COMMANDS ARE TO BE USED BELOW 80 NM IN PLACE OF THE COMMANDS WITH IDENTICAL LOAD ORDERS.

SEQUENCE NO. 147 - SEPARATE

USAGE - SAME AS SEQUENCE 146 EXCEPT OCV IS LEFT IN A FLY-FORWARD, PITCH ZERO CONDITION. ALSO THIS SEQUENCE DOES CONTAIN PPD ON COMMANDS THEREFORE THE SECURE KEY IS INCREMENTED.

SEQUENCE 147 - SEPARATE (ABOVE 80 N.M.)

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-880.0	400	BY IR+I-TM CH-AC+	8	PREDAC BY+
-879.0	482	01 000.1+00.0L14	15	ROLL + 0.0L
-710.0	338	R1-YLC PHC RLC IDE-ABE-TC-TQ-RT-CH-0	14	STAB.INIT
-700.0	386	PD IR+I-TM CH-AC+	1	PITCH DOWN
-200.0	337	R1+YLC PLF RLC IDE-ABE-TC-TQ-RT-CH-0	7	REC.ON
+ 24.0	326	R1+YLC PHC RLC IDE-ABE-TC-TQ-RT-CH-0	2	STAB.INIT
+ 24.5	482	01 000.1+00.0L14	6	ROLL + 0.0L
+ 25.0	397	PZ IR+I-TM CH-AC+	3	PITCH ZERO PREDAC BY-
+125.0	322	R1+YLC PLC RLC IDE-ABE-TC-TQ+RT-CH-0	12	YAW TORQUE
+200.0	232	T+R2-S-C+CP-12	13	VERLT OFF PPD ON
+201.0	192	T+R2-S+C-CP-12	9	VERLT ON PPD OFF
+270.0	220	T+R2+S+C+CP-6R	10	PPD ON PLAYBK ON
+575.0	312	R1+YLC PLC RLC IDE-ABE-TC-F+TQ-RT-CH-0	11	FLY FWD
+610.0	211	T-R2-S-C-CP-6R	4	TT+C OFF
+611.0	286	CPB R1-PO CP-YC PC RC	5	PLAYBK OFF

-710.0	319	R1-YHC PHC RLC IDE-ABE-TC-TQ-RT-CH-0	14	STAB.INIT
-200.0	333	R1+YHC PHF RHC IDE-ABE-TC-TQ-RT-CH+0	7	REC.ON
+ 24.0	315	R1+YHC PHC RHC IDE-ABE-TC-TQ-RT-CH-0	2	STAB.INIT
+125.0	316	R1+YHC PHC RHC IDE-ABE-TC-TQ+RT-CH-0	12	YAW TORQUE

THE ABOVE (4) ALTERNATE COMMANDS ARE TO BE USED BELOW 80 NM IN PLACE OF THE COMMANDS WITH IDENTICAL LOAD ORDERS.

SEQUENCE NO. 148 - SECURE

USAGE - THIS SEQUENCE CONTAINS THOSE COMMANDS WHICH ARE NECESSARY TO PERFORM THE TERMINAL COMMAND SYSTEM FUNCTIONS TO DEBOOST THE RV. THESE COMMANDS WILL BE LOADED AT THE LAST -PPD ON- STATION CONTACT PRIOR TO RV DEBOOST. WHEN TM DATA INDICATES THAT ALL RV DEBOOST CRITERIA [PITCHDOWN, YAW AROUND, ETC.] HAVE BEEN SATISFACTORILY ACCOMPLISHED, THEN 148 [SECURE] WILL BE LOADED. WHEN LOADED, ALL -PPD ON- STATION CONTACTS PRIOR TO RV DEBOOST WILL BE DELETED. ZERO TIME OF THE SEQUENCE IS RV RETRO FIRE TIME. THE TIME TAGS OF THESE COMMANDS SHOULD REMAIN FIXED WITH RESPECT TO EACH OTHER IN ALL CASES WITH THE EXCEPTION THAT AT LEAST [2] BACKUP 305 COMMANDS, WITH APPROPRIATELY DIFFERENT SECURE KEYS, MAY OCCUR AT 0.2 SECONDS INTERVALS FOLLOWING COMMAND 305 [AT -60.0]. IN THE EVENT OF A 10 PPS FAILURE USE DSPC NO. 5 COMMAND NO. 389 PLACED 0.1 SECONDS PRIOR TO -PPD ON- INSTEAD OF THE NORMALLY ASSEMBLED -OVERRIDE- COMMAND NO. 485.

SEQUENCE 148 - SECURE

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-70.0	348	R1+YLC PLF RLC IDE+ABE-TC-TQ-RT-CH+0	4	DS1 ENAB.,CH+
-60.0	305	ARM DS1	3	DS1,ARM,SECURE
-58.5	377	IR+I-DS2 TM CH-AC+	6	DS2
- 5.6	380	IR+I-TM TRA CH-AC+	2	TRANSFER
- 3.1	379	IR+I-TM CH-TRA AC+SEP	1	TRANSFER OCV/RV SEP
- 2.5	379	IR+I-TM CH-TRA AC+SEP	5	TRANSFER OCV/RV SEP

-70.0	346	R1+YHC PHF RHC IDE+ABE-TC-TQ-RT-CH+0	4	DS1 ENAB.,CH+

THE ABOVE ALTERNATE COMMAND IS TO BE USED BELOW 80 NM IN PLACE OF THE COMMAND WITH AN IDENTICAL LOAD ORDER.

SEQUENCE NO. 149 - EMERGENCY RV RECOVERY

USAGE - SV IS IN A - FLY FWD - CONDITION, AND THE RV MUST BE DEBOOSTED AS QUICKLY AS POSSIBLE. THIS SEQUENCE BEGINS 2010 SECONDS BEFORE RV RETRO, AND REQUIRES A TOTAL TIME OF 2124 SECONDS. ATTITUDE CONTROL OPERATIVE AND STABLE, PITCHED - ZERO - , RMA DISABLED. RV IS DEBOOSTED, OCV IS LEFT IN FLY REVERSE, PITCH ZERO CONDITION. THE YAW ERROR INTRODUCED BY THE LACK OF SETTLING WILL BE +/-3.6 DEGREES, AN ACCEPTABLE VALUE. THIS SEQUENCE IS DESIGNED FOR LOADING AT POGO ONE REV PRIOR TO RV DEBOOST OR AT POGO ON THE RV DEBOOST REV. THE SAME SECURE KEY IS INCLUDED IN EITHER MESSAGE. IF LOADED, ONE REV PRIOR TO RV DEBOOST, THE DELAY LINE CONTAINING THE POGO RV DEBOOST REV STATION CONTACT MUST BE ERASED TO PREVENT AN ERROR IN THE SECURE KEY. THE SECURE PIN PULL EVENT IS MONITORED WITH TLM.
R1- OCCURS AT THE ENTRANCE OF THE HULA CONE IN THE NORMAL STATION PASS SEQUENCE.

SEQUENCE 149 - EMERGENCY RV RECOVERY

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-2010.0	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	3	REC.ON
-2000.0	329	R1+YHC PHC RHC IDE+ABE-TC-TQ+RT-CH+0	4	YAW TORQUE DS1 ENAB.,CH+
-1800.0	304	DS1	8	DS1
-1798.5	401	BY IR+I-DS2 TM CH-AC+	7	PREDAC BY+,DS2
-1798.0	482	01 000.1+00.0L14	14	ROLL + 0.0L
-1550.0	325	R1+YHC PHC RHC IDE+ABE-TC-TQ-F-RT-CH-0	11	FLY REV,CH-
-1540.0	386	PD IR+I-TM CH-AC+	5	PITCH DOWN
-1440.0	286	CPB R1-PO CP-YC PC RC	17	REC.OFF
- 850.0	192	T+R2-S+C-CP-12	1	T+T ON
- 550.0	291	TIMER RESET	16	KEEP REC.ON
- 60.0	305	ARM DS1	12	ARM,DS1
- 5.6	380	IR+I-TM TRA CH-AC+	10	TRANSFER
- 3.1	379	IR+I-TM CH-TRA AC+SEP	9	TRANSFER OCV/RV SEP
- 2.8	379	IR+I-TM CH-TRA AC+SEP	15	TRANSFER OCV/RV SEP
+ 3.0	482	01 000.1+00.0L14	13	ROLL + 0.0L
+ 4.0	397	PZ IR+I-TM CH-AC+	6	PITCH ZERO PREDAC BY-
+ 114.0	323	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	2	STAB.INIT

SEQUENCE NO. 150 - OCV DEBOOST - AC

USAGE - SV STABLE, FLY REVERSE, PITCH ZERO

PLACE AC STABILIZATION SYSTEM IN ORBIT ADJUST CONFIGURATION. ACTIVATE OCV ENGINES FOR NECESSARY VELOCITY INCREMENT TO INSURE OCV DEBOOST IN A -SAFE- AREA. PROVIDE TRACKING AND TELEMETRY AND RECORDER MODE 2 PLAYBACK AS STATION CONTACTS REQUIRE, USING AUTOMATIC ASSEMBLY OF A STATION PASS SEQUENCE.

SEQUENCE 150 - OCV DEBOOST-AC

	TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
	-515.0	397	PZ IR+I-TM CH-AC+	7	PITCH ZERO
	-260.0	285	CPB R1-PO CP+YC PC RC	8	CPB,CP+
	- 40.0	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	6	REC.ON
	- 35.0	388	PTP IR+I-TM CH+AC+E-	11	PRESS.ENG.
	- 34.0	388	PTP IR+I-TM CH+AC+E-	4	PRESS.ENG.
	- 10.0	337	R1+YLC PLF RLC IDE-ABE-TC-TQ-RT-CH-0	5	STAR.INIT
	- 2.0	333	R1+YHC PHF RHC IDE-ABE-TC-TQ-RT-CH+0	3	STAR.INIT
DT	-200.0	194	T+R2+S+C-CP+12	9	PLAYBK ON T+T ON
DT	- 90.0	194	T+R2+S+C-CP+12	10	VERLT ON
	+ 0.0	300	E1+E2+	2	ENGS.ON,SECURE
	+ 1.0	300	E1+E2+	12	ENGS.ON,SECURE
DT	+ 0.0	371	IR+I-TM CH+AC+E-	1	ENGS.OFF
DT	+ 1.0	371	IR+I-TM CH+AC+E-	13	ENGS.OFF

SEQUENCE NO. 151 - EMERGENCY OCV DEBOOST

USAGE - THIS SEQUENCE WHICH COMBINES SOME OF THE COMMANDS OF SEQUENCE 131 [YAW AROUND TO REV] AND SEQUENCE 150 [OCV DEBOOST-AC] WITHOUT STATION CONTACT COMMANDS, IS TO BE USED ONLY FOR OCV DEBOOST ON THE SAME REV AS RV DEBOOST. TQ+ SHOULD NOT BE COMMANDED AT OR NEAR THE SUN LINE. IF BURN IS TO OCCUR AT THE SUN LINE, SEQUENCES 131 AND 150 SHOULD BE USED TO PREVENT IR INHIBIT.

SEQUENCE 151 - EMERGENCY OCV DEBOOST

TIME TAG	CMD NO	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-454.0	397	P7 IR+I-TM CH-AC+	8	PITCH ZERO
-453.0	482	01 000.1+00.0L14	2	ROLL + 0.0L
-452.0	322	R1+YLC PLC RLC IDE-ABE-TC-TQ+RT-CH-0	3	REC.ON YAW TORQUE
-451.0	388	PTP IR+I-TM CH+AC+E-	7	PRESS.ENG.
-450.0	388	PTP IR+I-TM CH+AC+E-	9	PRESS.ENG.
- 2.0	314	R1+YLC PLC RLC IDE-ABE-TC-TQ-F-RT-CH-0	1	FLY REV
- 1.0	333	R1+YHC PHF RHC IDE-ABE-TC-TQ-RT-CH+0	6	STAB.INIT,CH+
+ 0.0	300	E1+E2+	5	ENGS.ON,SECURE
+ 1.0	300	E1+E2+	10	ENGS.ON,SECURE
DT+ 0.0	371	IR+I-TM CH+AC+E-	4	ENGS.OFF
DT+ 1.0	371	IR+I-TM CH+AC+E-	11	ENGS.OFF
DT+ 5.0	323	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	12	REC.OFF,CH-

SEQUENCE NO. 152 - RA EXERCISE

USAGE - THIS SEQUENCE IS USED TO EXERCISE THE RA FUNCTION FOR A DELTA TIME. THIS SEQUENCE IS RECORDED.

SEQUENCE 152 - RA EXERCISE

TIME TAG	CMD NO	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-10.0	284	CPB R1+PO CP+YC PC RC	4	CP+
- 0.3	339	R1+YLC PLC RLC IDE-ABE-TC+TQ-RT-CH-0	5	TC+
+ 0.0	376	IR+RA I-TM CH-AC+	6	RA
DT+ 0.0	339	R1+YLC PLC RLC IDE-ABE-TC+TQ-RT-CH-0	1	TC+
DT+ 0.3	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	2	TC-
DT+10.0	286	CPB R1-PO CP-YC PC RC	3	CP-

SEQUENCE NO. 153 - IR DORMANCY [R1-]
NO. 154 - IR DORMANCY [R1+]

USAGE - THESE SEQUENCES ALLOW THE IR SCANNERS TO BE TURNED OFF FOR VARIABLE TIME INCREMENTS, MAINTAINING THE VEHICLE IN THE INERTIAL MODE. SEQUENCE 153 IS NOT RECORDED, SEQUENCE 154 IS RECORDED.

SEQUENCE 153 - IR DORMANCY [R1-]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-1.0	318	R1-YLC PLC RLC IDE+ABE-TC-TQ-RT-CH-0	3	IR- ENAB.
+0.0	399	IR-I+TM CH-AC+	4	IR OFF IR PREAMP
+1.0	323	R1-YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	2	IR- DISAB.
DT +0.0	389	IR+I-TM CH-AC+	1	IR ON

SEQUENCE 154 - IR DORMANCY [R1+]

TIME TAG	CMD NO.	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-1.0	345	R1+YLC PLC RLC IDE+ABE-TC-TQ-RT-CH-0	3	IR- ENAB.
+0.0	399	IR-I+TM CH-AC+	4	IR OFF IR PREAMP
+1.0	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	2	IR- DISAB.
DT +0.0	389	IR+I-TM CH-AC+	1	IR ON
DT +1.0	286	CPB R1-PO CP-YC PC RC	5	REC.OFF

SEQUENCE NO. 155 - TELL TALE - PRIMARY
NO. 156 - TELL TALE - BACKUP

USAGE - THESE SEQUENCES ARE LOADED INTO THE SAME DELAY LINE AS THE SECURE SEQUENCE 148. THEIR FUNCTION IS TO DETERMINE IF THE DELAY LINE IS OPERATING CORRECTLY AND IF THERE HAS BEEN A SHIFT IN CLOCK TIME. THIS IS DETERMINED BY THE LENGTH OF TIME THE RECORDER, IN PLAYBACK MODE, STAYS ON.

SEQUENCE 155 - TELL TALE - PRIMARY

TIME TAG	CMD NO	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-90.0	192	T+R2-S+C-CP-12	3	T+T ON VERLT ON
+30.0	189	T+R2+S+C-CP-6R	2	PLAYBK ON
+60.0	192	T+R2-S+C-CP-12	1	PLAYBK OFF
+70.0	497	01 005.0+00.0L14	4	ROLL + 0.0L

SEQUENCE 156 - TELL TALE - BACKUP

TIME TAG	CMD NO	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-89.0	192	T+R2-S+C-CP-12	3	T+T ON VERLT ON
+40.0	189	T+R2+S+C-CP-6R	2	PLAYBK ON
+50.0	192	T+R2-S+C-CP-12	1	PLAYBK OFF
+80.0	497	01 005.0+00.0L14	4	ROLL + 0.0L

SEQUENCE NO. 157 - PR CH+ TEST

USAGE - THIS SEQUENCE IS USED TO TEST THE PR AND CH+ FUNCTIONS.

SEQUENCE 157 - PR CH+ TEST

TIME TAG	CMD NO	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
+ 0.0	263	CPB R1-PR CP+YC PC RC	2	PR
+ 8.0	285	CPB R1-PO CP+YC PC RC	1	PO
+22.0	371	IR+I-TM CH+AC+E-	4	CH+
+30.0	389	IR+I-TM CH-AC+	3	CH-

SEQUENCE NO. 158 - BUSS EXECUTE [E+]

USAGE - THIS SEQUENCE IS USED TO DEBOOST THE RV AND THEN THE OCV USING THE BUSS EXECUTE MODE [BUX].

SEQUENCE 158 - BUSS EXCUTE [E+]

TIME TAG	CMD NO	COMMAND DESCRIPTOR	LO	SIGNIFICANT EVENTS
-112.0	320	R1+YLC PLC RLC IDE+ABE+TC-TQ-RT-CH-0	1	REC.ON,ABE+
-111.0	320	R1+YLC PLC RLC IDE+ABE+TC-TQ-RT-CH-0	2	ABE+
-110.0	301	BUX	3	BUX
-109.0	321	R1+YLC PLC RLC IDE-ABE-TC-TQ-RT-CH-0	4	ABE-
+ 5.0	388	PTP IR+I-TM CH+AC+E-	7	PRESS.ENG.
+ 5.3	388	PTP IR+I-TM CH+AC+E-	8	PRESS.ENG.
+ 35.0	300	E1+E2+	9	ENGS.ON
DT+ 35.0	371	IR+I-TM CH+AC+E-	5	ENGS.OFF
DT+ 35.3	371	IR+I-TM CH+AC+E-	6	ENGS.OFF
DT+ 40.0	286	CPB R1-PO CP-YC PC RC	10	REC.OFF

FINE DEADBAND CHANGES

THE FOLLOWING SEQUENCES MUST BE ALTERED TO OPERATE THE VEHICLE IN THE FINE DEADBAND MODE.

SEQS - 112, 114-117, 119, 121-127, 138-142, 152-154 AND 157.

THE BELOW ALTERATIONS MUST BE MADE TO CONVERT THE ABOVE SEQUENCES TO THE FINE DEADBAND MODE.

CHANGE CMD	TO CMD
263	241
267	240
277	287
281	266
284	262
285	279
* 286	282

CHANGE CMD	TO CMD
318	355
321	336
* 323	354
334	344
339	308
345	356

* NOTE - IN SEQUENCE 141 AT TIME 540.0 CMD NO. 286 IS CHANGED TO CMD NO. 268. In sequence 141 at time DT+60 changes 323 to 354.

THE FOLLOWING COMMANDS ARE DEFINED FOR USE IN ALTERED FINE DEADBAND SEQUENCES. IN ALL CASES THE COMMANDS DEFINED ARE IDENTICAL TO OLD COMMANDS EXCEPT FOR FINE DEADBANDS BEING COMMANDED.

NEW CMD	SAME AS OLD CMD EXCEPT NEW CMD HAS FINE DB.
240	267
241	263
308	339
336	321
344	334
354	323
355	318
356	345

DECODER INPUT ADDRESSES-

	BITS		
BIT NUMBER......	26	27	28
SSPC NO.2	0	0	0
SSPC NO.1	0	0	1
DSPC NO.6	0	1	0
DSPC NO.5	0	1	1
DSPC NO.4	1	0	0
DSPC NO.3	1	0	1
DSPC NO.2	1	1	0
DSPC NO.1	1	1	1

ASSIGNED COMMAND NUMBER GROUPINGS-

SSPC NO.1	240 TO 289
SSPC NO.2	170 TO 239 *
DSPC NO.1	292 TO 307
DSPC NO.2	450 TO 464
DSPC NO.3	465 TO 499
DSPC NO.4	308 TO 369
DSPC NO.5	370 TO 430
DSPC NO.6	291
RTC	1 TO 16
HYBRIDS	500 TO 510
DUMMY	290
UNDEFINED	431 TO 449

* PPD ON COMMANDS MUST APPEAR WITHIN THE COMMAND NUMBER RANGE, 212 TO 238, TO BE HANDLED CORRECTLY IN THE C + C COMPUTER PROGRAMS. PPD OFF COMMANDS MUST NOT APPEAR WITHIN THIS RANGE.

REAL TIME COMMAND LIST

CMD NO.	[BCD] COMMAND DESCRIPTOR	PARITY ILTSYD .. 12345	MSD . 67	
RTC				
1	SELECT LINE 1	00000	00	... SEL. DELAY LINE 1 FOR LOADING
2	SELECT LINE 2	11000	00	... SEL. DELAY LINE 2 FOR LOADING
3	SELECT LINE 3	10100	00	... SEL. DELAY LINE 3 FOR LOADING
4	SELECT LINE 4	01100	00	... SEL. DELAY LINE 4 FOR LOADING
5	BALANCE VALVE OPEN. . .	10010	00	... VALVE BETWEEN HIGH + LOW SYS. *
6	VOLTAGE DROPPING BYPASS	01010	00	... A ZENER NETWORK PROTECTS BUSS CIRCUITRY BY CLAMPING VOLTAGE BELOW 29 VDC. RTC 6 IS USED WHEN VOLTAGE FALLS BELOW 29 VDC. *
7	TM XMTRS, NORMAL	00110	00	... TELEMETRY XMTRS NORMAL DELTA 2 - REAL TIME MODE DELTA 3 - PLAYBACK MODE
8	TM XMTRS, REVERSED	11110	00	... TELEMETRY XMTRS REVERSED
9	PPD OFF	10001	00	... PULSE POSITION DEMODULATOR OFF
10	BALANCE VALVE CLOSE . .	01001	00	... VALVE BETWEEN HIGH + LOW SYS *
11	HIGH SELECTOR VALVE CLOSE	00101	00	... VALVE BETWEEN TANK AND NOZZLE *
12	LOW SELECTOR VALVE CLOSE	11101	00	... VALVE BETWEEN TANK AND NOZZLE *
13	RECORDER PLAYBACK ON ..	00011	00	... FLIGHT REC. PLAYBACK MODE ON
14	RECORDER PLAYBACK OFF .	11011	00	... FLIGHT REC. PLAYBACK MODE OFF
15	SEARCH MODE ON	10111	00	... IR SEARCH MODE ON
16	HIGH + LOW SELECTOR VALVES OPEN	01111	00	... VALVES BETWEEN TANK AND NOZZLE *

HYBRID COMMANDS

TIME PARITY**** (bit 24) PARITY 1 TO 36**** (bit 37)

CMD NO.	[BCD] COMMAND DESCRIPTOR	1	...	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
500	REAL TIME ENABLE	1	...	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
501	ERASE	0	...	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0

COMMAND NO. 500 CAUSES THE COMMAND DECODER TO OPERATE IN THE - REAL TIME - MODE.
COMMAND NO. 501 ERASES THE PREVIOUSLY SELECTED DELAY LINE OF THE STORAGE PROGRAMMER.

DUMMY COMMAND

TIME PARITY**** (bit 24) PARITY 1 TO 36**** (bit 37)

CMD NO.	[BCD] COMMAND DESCRIPTOR	1	2	3	...	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
290	DUMMY [TIME TAG = 0.3 SEC]	1	1	0	...	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1

290, WHEN LOADED AS THE LAST COMMAND IN A DELAY LINE, ALLOWS THE PREVIOUS [IN LOADING ORDER] SSPC TO BE READ OUT OF THE PROGRAMMER AND EXECUTED. IT IS NOT REQUIRED WHEN THE LAST COMMAND IN A GIVEN DELAY LINE IS A DSPC OR NO. 291.

TIMER RESET COMMAND

TIME LABEL (bits 1 ... 23), TIME PARITY*** (bit 24), WORD DEFINING BIT** (bit 25), DECODER INPUT ADDRESS*** (bits 26-28), PARITY 1 TO 36**** (bit 37)

CMD NO.	[BCD] COMMAND DESCRIPTOR	1	...	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
291	TIMER RESET [6 MINUTE RESETTABLE TIMER MODE]					0	0	1	0	0	0	0	0	0	0	0	0	1

THE 291 COMMAND CAUSES RESET OF THE POWER CONTROLLER TIMER [IN 6 OR 12 MINUTE RESETTABLE MODE] FOR AN ADDITIONAL 6 MINUTES WHEN ITS TIME TAG OCCURS.
NO. 291 IS A DSPC 6 COMMAND [1ST WORD ONLY DEFINED].

DSPC NO.1

BIT PATTERNS

CMD NO.	COMMAND DESCRIPTOR	1ST WORD: TIME LABEL 1...23	TIME PARITY 24	[0] WORD DEFINING BIT 25	DECODER INPUT ADDRESS* 26	27	28	SECURE KEY WORD* 29...36	PARITY 1 TO 36 37	2ND WORD: SECURE KEY WORD* 1...23	PARITY 1 TO 23 24	[1] WORD DEFINING BIT 25	SECURE KEY WORD* 26...30	ARM ON/NORM 31	ENGINE 1 ON/NORM 32	ENGINE 2 ON/NORM 33	DS1 ON/NORM 34	BUSS EXECUTE ON/NORM 35	SPARE 36	PARITY 1 TO 36 37
299	SECURE CHECK			0	1	1	1					1		0	0	0	0	0		
300	E1+E2+			0	1	1	1					1		0	1	1	0	0		
301	BUX			0	1	1	1					1		0	0	0	0	1		
302	E1+			0	1	1	1					1		0	1	0	0	0		
303	E2+			0	1	1	1					1		0	0	1	0	0		
304	DS1			0	1	1	1					1		0	0	0	1	0		
305	ARM DS1			0	1	1	1					1		1	0	0	1	0		

SSPC NO.2 1ST WORD

BIT PATTERNS

```
                              1      *         T.W          T  R.S    C.C    T .P
                              /*******         I.O             2.      .P    I .A
                              0      *         M.R          +   .+    +.     M .R
                                               E.D          /  +./    /.+    E .
                                                .           -  /.-    -./    R .1
                                               P.2 DECOD       -.      .-      .T
                              TIME             A./ INPUT        .      .     M .0
                              LABEL            R.1 ADDRS        .      .     0 .3
      [BCD]                   *******           .  *****        .      .   ***.6
CMD   COMMAND.                1 TO 23          25   27   29   31   33.  35   37
NO.   DESCRIPTOR                          24.  26   28   30.  32   34   36.
```

CMD NO.	[BCD] COMMAND. DESCRIPTOR	25	26	27	28	29	30	31	32	33	34	35	36	37
		P.A.R.1	DECOD INPUT ADDRS			T	R.2.	S		C	CP		TIMER	PAR.1
185	T-R2-S-C-CP-12	0	0	0	0	0	0	0	0	0	0	0	1	1
186	T-R2+S-C-CP-6R	0	0	0	0	0	1	0	0	0	0	0	0	1
187	T-R2+S+C-CP-6R	0	0	0	0	0	1	1	0	0	0	0	0	0
188	T+R2-S+C-CP-6R	0	0	0	0	1	0	1	0	0	0	0	0	0
189	T+R2+S+C-CP-6R	0	0	0	0	1	1	1	0	0	0	0	0	1
190	T-R2-S-C-CP-CD-	0	0	0	0	0	0	0	0	0	0	1	1	0
191	T+R2-S-C-CP+12	0	0	0	0	1	0	0	0	0	1	0	1	1
192	T+R2-S+C-CP-12	0	0	0	0	1	0	1	0	0	0	0	1	1
193	T+R2-S+C-CP+12	0	0	0	0	1	0	1	0	0	1	0	1	0
194	T+R2+S+C-CP+12	0	0	0	0	1	1	1	0	0	1	0	1	1
195	T-R2-S+C-CP+12	0	0	0	0	0	0	1	0	0	1	0	1	1
196	T+R2+S+C-CP+CD-	0	0	0	0	1	1	1	0	0	1	1	1	0
197	T+R2+S-C-CP+12	0	0	0	0	1	1	0	0	0	1	0	1	0
198	T+R2-S+C-CP+CD-	0	0	0	0	1	0	1	0	0	1	1	1	1
199	T+R2-S-C-CP+CD-	0	0	0	0	1	0	0	0	0	1	1	1	0
200	T+R2-S-C-CP+6R	0	0	0	0	1	0	0	0	0	1	0	0	0
201	T+R2-S+C-CP+6R	0	0	0	0	1	0	1	0	0	1	0	0	1
202	T+R2-S-C-CP+6	0	0	0	0	1	0	0	0	0	1	1	0	1
203	T+R2+S+C-CP+6R	0	0	0	0	1	1	1	0	0	1	0	0	0
204	T+R2-S+C-CP+6	0	0	0	0	1	0	1	0	0	1	1	0	0
205	T+R2+S+C-CP+6	0	0	0	0	1	1	1	0	0	1	1	0	1
206	T-R2-S-C-CP+6R	0	0	0	0	0	0	0	0	0	1	0	0	1
207	T-R2-S+C-CP+6	0	0	0	0	0	0	1	0	0	1	1	0	1
208	T+R2+S-C-CP+6	0	0	0	0	1	1	0	0	0	1	1	0	0
209	T+R2+S-C-CP+6R	0	0	0	0	1	1	0	0	0	1	0	0	1
210	T-R2-S-C-CP-6	0	0	0	0	0	0	0	0	0	0	1	0	1
211	T-R2-S-C-CP-6R	0	0	0	0	0	0	0	0	0	0	0	0	0
212	T-R2-S+C+CP+6	0	0	0	0	0	0	1	0	1	1	1	0	0
213	T+R2-S+C+CP+6R	0	0	0	0	1	0	1	0	1	1	0	0	0
214	T-R2-S+C+CP+6R	0	0	0	0	0	0	1	0	1	1	0	0	1
215	T+R2+S+C+CP+12	0	0	0	0	1	1	1	0	1	1	0	1	0
216	T+R2-S-C+CP+6R	0	0	0	0	1	0	0	0	1	1	0	0	1
217	T+R2+S+C+CP+6R	0	0	0	0	1	1	1	0	1	1	0	0	1
218	T+R2+S+C+CP+6	0	0	0	0	1	1	1	0	1	1	1	0	0
219	T+R2-S+C+CP-6R	0	0	0	0	1	0	1	0	1	0	0	0	1
220	T+R2+S+C+CP-6R	0	0	0	0	1	1	1	0	1	0	0	0	0
231	T+R2-S+C+CP+12	0	0	0	0	1	0	1	0	1	1	0	1	1
232	T+R2-S-C+CP-12	0	0	0	0	1	0	0	0	1	0	0	1	1
233	T+R2-S+C+CP-12	0	0	0	0	1	0	1	0	1	0	0	1	0
234	T+R2-S+C+CP+6	0	0	0	0	1	0	1	0	1	1	1	0	1
235	T-R2+S+C+CP+6R	0	0	0	0	0	1	1	0	1	1	0	0	0
236	T+R2+S-C+CP+6	0	0	0	0	1	1	0	0	1	1	1	0	1
237	T-R2-S-C+CP-6R	0	0	0	0	0	0	0	0	1	0	0	0	1
238	T+R2+S-C+CP+6R	0	0	0	0	1	1	0	0	1	1	0	0	0

SSPC NO.1 1ST WORD
BIT PATTERNS

```
                                  1      *      T.W       C R.P P C.Y P R.P
                                  /******       I.O       P 1.B B P.D D D.A
                                  0      *      M R         2 3   B B B R
                                                E D       A *     *
                                                          / / * * / F F F 1
                                                P 2 DECOD B - / / - / / / T
                                  TIME          A / INPUT     - -   C C C O
                                  LABEL         R 1 ADDRS                 3
       (BCD)                      *******         *****                   6
CMD    COMMAND                    1 TO 23   25   27   29   31   33   35   37
NO.    DESCRIPTOR                        24.  26   28   30.  32   34   36.
```

CMD NO.	COMMAND DESCRIPTOR	24	25	26	27	28	29	30	31	32	33	34	35	36
253	CPB R1+PO CP+YC PC RF	0	0	0	1	0	1	0	0	1	0	0	1	0
254	CPA R1+PR CP+YF PF RF	0	0	0	1	1	1	1	1	1	1	1	1	1
255	CPA R1-PR CP+YF PF RF	0	0	0	1	1	0	1	1	1	1	1	1	0
256	CPB R1-PR CP-YC PC RC	0	0	0	1	0	0	1	1	0	0	0	0	1
257	CPA R1-PS CP+YC PC RC	0	0	0	1	1	0	1	0	1	0	0	0	0
258	CPA R1+PS CP+YC PC RC	0	0	0	1	1	1	1	0	1	0	0	0	1
259	CPA R1+PP CP+YF PF RF	0	0	0	1	1	1	0	1	1	1	1	1	0
260	CPA R1-PS CP+YF PF RF	0	0	0	1	1	0	1	0	1	1	1	1	1
261	CPA R1+PS CP+YF PF RF	0	0	0	1	1	1	1	0	1	1	1	1	0
262	CPB R1+PO CP+YF PF RF	0	0	0	1	0	1	0	0	1	1	1	1	0
263	CPB R1-PR CP+YC PC RC	0	0	0	1	0	0	1	1	1	0	0	0	0
264	CPB R1-PS CP+YC PC RC	0	0	0	1	0	0	1	0	1	0	0	0	1
265	CPB R1+PS CP-YF PF RF	0	0	0	1	0	1	1	0	0	1	1	1	0
266	CPB R1+PO CP-YF PF RF	0	0	0	1	0	1	0	0	0	1	1	1	1
267	CPB R1+PR CP-YC PC RC	0	0	0	1	0	1	1	1	0	0	0	0	0
268	CPB R1-PO CP-YF PF RC	0	0	0	1	0	0	0	0	0	1	1	0	1
269	CPA R1+PO CP-YF PF RF	0	0	0	1	1	1	0	0	0	1	1	1	0
270	CPA R1-PO CP+YF PF RF	0	0	0	1	1	0	0	0	1	1	1	1	0
271	CPA R1+PO CP+YF PF RC	0	0	0	1	1	1	0	0	1	1	1	0	0
272	CPB R1+PS CP+YF PF RF	0	0	0	1	0	1	1	0	1	1	1	1	1
273	CPB R1+PS CP+YC PC RC	0	0	0	1	0	1	1	0	1	0	0	0	0
274	CPB R1+PO CP+YF PF RC	0	0	0	1	0	1	0	0	1	1	1	0	1
275	CPA R1-PR CP+YC PC RC	0	0	0	1	1	0	1	1	1	0	0	0	1
276	CPB R1-PS CP-YF PF RF	0	0	0	1	0	0	1	0	0	1	1	1	1
277	CPA R1+PO CP+YC PC RC	0	0	0	1	1	1	0	0	1	0	0	0	0
278	CPB R1-PS CP-YC PC RC	0	0	0	1	0	0	1	0	0	0	0	0	0
279	CPB R1-PO CP+YF PF RF	0	0	0	1	0	0	0	0	1	1	1	1	1
280	CPB R1+PS CP-YC PC RC	0	0	0	1	0	1	1	0	0	0	0	0	1
281	CPB R1+PO CP-YC PC RC	0	0	0	1	0	1	0	0	0	0	0	0	0
282	CPB R1-PO CP-YF PF RF	0	0	0	1	0	0	0	0	0	1	1	1	0
283	CPB R1+PO CP-YF PC RC	0	0	0	1	0	1	0	0	0	1	0	0	1
284	CPB R1+PO CP+YC PC RC	0	0	0	1	0	1	0	0	1	0	0	0	1
285	CPB R1-PO CP+YC PC RC	0	0	0	1	0	0	0	0	1	0	0	0	0
286	CPB R1-PO CP-YC PC RC	0	0	0	1	0	0	0	0	0	0	0	0	1
287	CPA R1+PO CP+YF PF RF	0	0	0	1	1	1	0	0	1	1	1	1	1
288	CPA R1-PO CP+YC PC PC	0	0	0	1	1	0	0	0	1	0	0	0	1
289	CPA R1-PO CP-YC PC RC	0	0	0	1	1	0	0	0	0	0	0	0	0

DSPC NO.4 1ST WORD

BIT PATTERNS

T. .P
I. .A
M. .R
E.**WORD DEF BIT [0] .
.* .1
P.* DECOD .T
TIME A.* INPUT .0
LABEL R.* ADDRS .3
[BCD] ******* .* ***** .6

CMD NO.	[BCD] COMMAND. DESCRIPTOR	TIME LABEL 1 TO 23	24.	25	26	27	28	29	30.	31	32	33	34	35	36.	37
309	R1+YLF PLC RLC IDF-ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
310	R1-YLC PLC RLC IDF-ABE-TC-F+TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
311	R1+YLF PLF RLF IDF-ABE-TC-TQ-RT+CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
312	R1+YLC PLC RLC IDF-ABE-TC-F+TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
313	R1-YLC PLC RLC IDF-ABE-TC-TQ-F-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
314	R1+YLC PLC RLC IDF-ABE-TC-TQ-F-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
315	R1+YHC PHC RHC IDF-ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
316	R1+YHC PHC RHC IDF-ABE-TC-TQ+RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
317	R1-YLC PLC PLC IDF-ABE-TC+TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
318	R1-YLC PLC RLC IDF+ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
319	R1-YHC PHC RLC IDF-ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
320	R1+YLC PLC RLC IDF+ABE+TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
321	R1+YLC PLC RLC IDF-ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
322	R1+YLC PLC RLC IDF-ABE-TC-TQ+RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
323	R1-YLC PLC RLC IDF-ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
324	R1-YLF PLF RLF IDF-ABE-TC-TQ-RT+CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
325	R1+YHC PHC RHC IDF+ABE-TC-TQ-F-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
326	R1+YLC PHC RLC IDF-ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
327	R1-YLC PHC RLC IDF+ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
328	R1-YLC PLC RLC IDF+ABE-TC-TQ-RT-CH+0			0	1	0	0	0	0	0	0	0	0	0	0	1
329	R1+YHC PHC RHC IDF+ABE-TC-TQ+RT-CH+0			0	1	0	0	0	0	0	0	0	0	0	0	1
330	R1-YLC PLC RLC IDF-ABE-TC-TQ+RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
331	R1+YLC PLC PLC IDF-ABE-TC+TQ-RT-CH-3			0	1	0	0	0	0	0	0	0	0	0	0	1
332	R1+YLF PHC RHC IDF-ABE-TC-TQ-RT+CH+0			0	1	0	0	0	0	0	0	0	0	0	0	1
333	R1+YHC PHF RHC IDF-ABE-TC-TQ-RT-CH+0			0	1	0	0	0	0	0	0	0	0	0	0	1
334	R1-YLC PLC RLC IDF-ABE-TC-TQ-RT-CH-2			0	1	0	0	0	0	0	0	0	0	0	0	1
335	R1-YLC PLC RLC IDF-ABE-TC-TQ-RT-CH-3			0	1	0	0	0	0	0	0	0	0	0	0	1
337	R1+YLC PLF RLC IDF-ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
338	R1-YLC PHC RLC IDF-ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
339	R1+YLC PLC RLC IDF-ABE-TC+TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
340	R1+YLF PLF RLF IDF-ABE-TC-F+TQ-RT+CH-2			0	1	0	0	0	0	0	0	0	0	0	0	1
341	R1+YLF PLF RLF IDF-ABE-TC-F+TQ-RT+CH-3			0	1	0	0	0	0	0	0	0	0	0	0	1
342	R1+YLF PLF RLF IDF-ABE-TC-F+TQ-RT+CH-1			0	1	0	0	0	0	0	0	0	0	0	0	1
343	R1+YLF PLF RLF IDF-ABE-TC-F+TQ-RT+CH-A			0	1	0	0	0	0	0	0	0	0	0	0	1
345	R1+YLC PLC RLC IDF+ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
346	R1+YHC PHF RHC IDF+ABE-TC-TQ-RT-CH+0			0	1	0	0	0	0	0	0	0	0	0	0	1
347	R1+YHC PHF RHC IDF-ABE-TC-TQ-F-RT-CH+0			0	1	0	0	0	0	0	0	0	0	0	0	1
348	R1+YLC PLF RLC IDF+ABE-TC-TQ-RT-CH+0			0	1	0	0	0	0	0	0	0	0	0	0	1
349	R1-YLF PLF RLF IDF-ABE-TC-TQ-RT+CH-2			0	1	0	0	0	0	0	0	0	0	0	0	1
350	R1-YLF PLF RLF IDF-ABE-TC-TQ-RT+CH-3			0	1	0	0	0	0	0	0	0	0	0	0	1
351	R1-YLF PLF RLF IDF-ABE-TC-TQ-RT+CH-1			0	1	0	0	0	0	0	0	0	0	0	0	1
352	R1-YLF PLF RLF IDF-ABE-TC-TQ-RT+CH-A			0	1	0	0	0	0	0	0	0	0	0	0	1
353	R1-YHC PLC RLC IDF-ABE-TC-TQ-RT-CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1
357	R1+YHF PHF RHC IDF-ABE-TC-TQ-RT+CH-0			0	1	0	0	0	0	0	0	0	0	0	0	1

DSPC NO.4 2ND WORD

BIT PATTERNS

1 *
/****
0 *

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	
															R 1 + / -	Y L E V L / H	P L E V L / H	R L E V L / H		Y D B F / C	I D E + / -	A B E + / -	P A R 1 T 0 2 3	W O R D 2 / 1	P D B F / C	R D B F / C	T C + / -	F + / N O R M	T Q + / -	2 0 / 2 1 E / D	F - / N O R M	C 2 0 S / R	C 2 1 S / R	R T - / +	C H + / -	P A R 1 T 0 36	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	309
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	1	0	1	310
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	311
+0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	312
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	1	0	1	313
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	314
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	315
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	1	316
+0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	1	0	1	317
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	318
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	319
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	320
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	321
+0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	1	322
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	323
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	324
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	1	325
+0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	326
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	327
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	328
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	329
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	1	330
+0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	0	1	0	0	1	0	1	1	1	0	0	331
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	332
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	1	0	333
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0	1	0	0	334
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	1	0	0	0	0	0	1	0	1	1	1	0	1	335
+0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	337
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	338
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	1	339
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0	1	0	0	0	0	340
+0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0	1	1	0	0	1	341
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0	0	1	0	0	0	342
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	1	1	1	1	0	1	0	1	0	0	0	0	0	1	343
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	345
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	1	1	0	346
+0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	1	1	1	347
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	1	0	348
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	1	1	1	0	0	0	1	0	1	0	0	0	1	349
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	1	1	1	0	0	0	1	0	1	1	0	0	0	350
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	1	1	1	0	0	0	1	0	0	1	0	0	1	351
+0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	1	1	1	0	0	0	1	0	0	0	0	0	0	352
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	353
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	357

DSPC NO.5 1ST WORD

BIT PATTERNS

```
                          1     *        T W            R B F      P P *
                          /*****         I O            P Y -      Z A *
                          0     *        M R            U / /      / R *
                                         E D            / N N      N   *
                                                        N O O      O 1 *
                                         P 2 DECOD      O R R      R T *
                          TIME           A / INPUT      R M M      M O *
                          LABEL          R 1 ADDRS      M            3 *
    (BCD)                 *******    .   *****      .      .      .6
CMD  COMMAND              1 TO 23  25   27   29   31   33.  35   37
NO.  DESCRIPTOR                  24. 26   28   30.  32   34   36.
```

370	IR-I+OVS TM CH+AC-	0	0	1	1	0	0	0	0	0	0	0	0	0	*
371	IR+I-TM CH+AC+E-	0	0	1	1	0	0	0	0	0	0	0	0	0	
372	SFS IR-I-TM CH+AC-	0	0	1	1	0	0	0	0	0	0	0	0	0	
373	IR+I-TA CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	
374	IR+FA I-TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	*
375	IR-CPR I-TM CH+AC-	0	0	1	1	0	0	0	0	0	0	0	0	0	*
376	IR+RA I-TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	*
377	IR+I-DS2 TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	*
378	IR-I-OVS TM CH+AC-	0	0	1	1	0	0	0	0	0	0	0	0	0	*
379	IR+I-TM CH-TRA AC+SEP	0	0	1	1	0	0	0	0	0	0	0	0	0	
380	IR+I-TM TRA CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	
381	RPU IR-I+TM CH-AC+	0	0	1	1	0	0	1	0	0	0	0	0	1	
382	PD IR+I-TM CH+AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	
383	IR+I-TM CH-AC+CT	0	0	1	1	0	0	0	0	0	0	0	0	0	
384	IR-I-TM CH+AC-	0	0	1	1	0	0	0	0	0	0	0	0	0	
385	IR+I+TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	
386	PD IR+I-TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	
387	IR+SM-I-TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	
388	PTP IR+I-TM CH+AC+E-	0	0	1	1	0	0	0	0	0	0	0	0	0	
389	IR+I-TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	
391	PZ IR-SM-I-TM CH+AC-	0	0	1	1	0	0	0	0	0	0	0	1	1	
392	IR-I-TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	
393	IR+I+OVS TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	*
394	IR+I-TM CH-AC+E-	0	0	1	1	0	0	0	0	0	0	0	0	0	
395	PZ IR-I+TM CH+AC-	0	0	1	1	0	0	0	0	0	0	0	1	1	
396	PZ IR+I+TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	1	1	
397	PZ IR+I-TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	1	1	
398	IR+I-DS2 TM CH+AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	*
399	IR-I+TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	
400	BY IR+I-TM CH-AC+	0	0	1	1	0	0	0	1	0	0	0	0	1	
401	BY IR+I-DS2 TM CH-AC+	0	0	1	1	0	0	0	1	0	0	0	0	1	*
402	PZ EP+IR+I-TM CH-AC+E-	0	0	1	1	0	0	0	0	0	0	0	1	1	
403	EP-IR+I-TM CH-AC+	0	0	1	1	0	0	0	0	0	0	0	0	0	

DSPC NO.5 2ND WORD

PD/NORM	EP+/NORM	EP-/NORM	PTP/NORM	SFS/NORM		IR+/-	SM-/NORM	FA/NORM	RA/NORM	CPR/NORM	I+/-	OVS/NORM	DS2/NORM	TA/TM	TRA/NORM		CH+/-	AC+/-		1 **/** 0		23	PAR 1T0	WORD 2/1					CT/NORM			SEP/NORM			E-/NORM 36	PAR 1T0	
1	2	3.	.4	5	6.	.7	8	9.	10	11	12.	13	14	15.	16	17	18.	19	20	21.	22	23	24.	25	26	27	28	29	30.	31	32	33.	34	35	36.	37	
0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	370*
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	371
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	372
+0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	373
0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	374*
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	375*
0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	376*
+0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	377*
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	378*
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	379
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	380
+0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	381
1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	382
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	383
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	384
+0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	385
1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	386
0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	387
0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	388
+0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	389
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	391
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	392
0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	393*
+0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	394
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	395
0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	396
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	397
+0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	398*
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	399
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	400
0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	401
+0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	402
0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	403

DSPC NO.2   1ST WORD

BIT PATTERNS

```
                                                      T.[0]                      .P
                                                      I.                         .A
                                                      M.W                        .R
                                                      E.O                        .I
                                                       .R                        .T
                                                      P.D                        .Y
                                                      A.                         .
                                                      R.D                        .
                                                      I.E                        .1
                                                      T.F                        .
                                                      Y.              [T3-T2]*** .T
                                                       .B                    *   .0
                                                       .I DECOD  GFE 1-C1    *   .
                                              TIME     .T INPUT     TO       *   .3
                                              LABEL    .  ADDRS  GFE 1-C6    *   .6
       [BCD]                                  *******  .  ***** *********** ***.
CMD  COMMAND                                  1 TO 23  25  27  29  31  33  35  37
NO.  DESCRIPTOR                                      24. 26  28  30. 32  34  36.
450 01/01 30.5-34.7M+45.4H14 [09.5/11.4]         0 1 1 0 0 1 1 0 1 0 1 1 1
451 01/01 30.5+41.1L+01.4H14 [09.5/11.4]         0 1 1 0 0 1 1 0 1 0 1 1 1
452 01/01 24.1+45.4H+45.4L14 [07.5/09.0]         0 1 1 0 0 1 1 0 1 0 1 0 0

453 01/01 24.1-44.7H-44.7L14 [07.5/09.0]         0 1 1 0 0 1 1 0 1 0 1 0 0
454 01/01 12.1+01.4L+02.8M14 [03.9/04.2]         0 1 1 0 0 1 1 0 1 0 1 0 0
455 01/01 12.1+00.7L-00.7M14 [03.9/04.2]         0 1 1 0 0 1 1 0 1 0 1 0 0

456 01/01 10.1+04.3M+00.0L13 [03.5/03.0]         0 1 1 0 0 1 1 0 1 0 0 0 1
457 01/01 10.1+04.3M+00.0L14 [03.5/03.0]         0 1 1 0 0 1 1 0 1 0 0 0 1
```

BRACKETED TIME REPRESENTS [T2 - T1] OR
[T4 - T3 - 0.1], FOLLOWED BY [T3 - T2].

```
 DSPC NO.2          2ND WORD                              .W                    .P
 ---------          --------                             P.O                    .A
 BIT PATTERNS                                            A.R          R         .R
                                                         R.D          O         .
                                                          .           L         .
                                                         1.D          L         .1
                                                          .E                    .
                   **ROLL RATE                           T.F          R         .T
                   *                                     O.           A         .O
****[T3-T2]        *    T2-T1     GFE 1-C1                .B          T  GFE 1-C8 .
**                 *     AND         TO        ROLL      2.I  ROLL    E     TO    .3
*  ROLL ANGLE      *    T4-T3     GFE 1-C6     ANGLE     3.T  ANGLE   *  GFE 1-C12.6
* ************* *** ******* *********** *****             .  ******* *** *********.
```

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	
1	1	0	0	0	1	1	1	0	1	1	1	1	1	0	1	1	0	1	0	0	0	0	1	1	0	0	0	0	1	1	0	1	1	0	0	1	450
1	0	1	1	0	0	0	0	0	0	1	1	1	1	0	1	1	0	1	0	0	1	1	0	1	1	1	1	0	1	1	0	1	1	0	0	0	451
1	0	0	0	0	0	0	0	1	1	0	1	0	1	0	1	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	452
1	1	1	1	1	1	1	1	1	1	0	1	0	1	0	1	1	0	1	0	1	1	1	0	1	1	1	1	1	0	0	0	1	1	0	0	1	453
0	0	1	1	1	1	1	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0	1	0	1	1	1	1	0	0	1	0	1	1	0	0	1	454
0	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	1	0	1	0	1	0	0	1	1	0	0	0	1	0	1	0	1	1	0	0	1	455
0	0	1	0	1	1	1	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	1	1	1	456
0	0	1	0	1	1	1	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	457

DSPC NO.3 1ST WORD

BIT PATTERNS

TIME LABEL (1 TO 23) · T.(0) TIME WORD · PARITY (24) · .BIT (25) · DECOD INPUT ADDRS (26–28) · GFE 1-C1 TO GFE 1-C6 (29–35) · (T2-T1)*** · .PARITY .1 .TO .36

CMD NO.	CMD	(BCD) COMMAND DESCRIPTOR		25	26	27	28	29	30	31	32	33	34	35	36	37	
465	01	006.0+02.1L13		0	1	0	1	0	1	1	0	1	0	1	1	1	
456	01	008.0+00.0M13		0	1	0	1	0	1	1	0	1	0	1	1	1	
467	01	006.0+45.4H13		0	1	0	1	0	1	1	0	1	0	1	1	1	
468	01	004.0-44.7H13		0	1	0	1	0	1	1	0	1	0	1	1	1	
469	64	012.0+00.0L13		0	1	0	1	1	1	0	1	1	1	1	1	1	
470	64	012.0+00.0L14		0	1	0	1	1	1	0	1	1	1	1	1	1	
471	55	013.0+00.0L14		0	1	0	1	0	0	1	0	0	0	1	0	0	
472	46	014.0+00.0L33		0	1	0	1	1	1	1	0	1	1	1	1	1	
473	37	015.0+00.0L14		0	1	0	1	0	0	0	1	0	0	1	0	0	
474	28	016.0+00.0L03		0	1	0	1	1	0	1	0	0	1	1	1	1	
476	19	017.0+00.0L34		0	1	0	1	0	1	0	1	1	0	1	0	0	
477	10	018.0+00.0L03		0	1	0	1	1	0	0	1	0	1	1	1	1	
478	01	000.1+45.4H10		0	1	0	1	0	1	1	0	1	0	0	1	0	*
479	01	000.1-44.7H10		0	1	0	1	0	1	1	0	1	0	0	1	0	*
480	01	019.0+00.0L14		0	1	0	1	0	1	1	0	1	0	1	0	0	
481	64	102.4+00.0L14		0	1	0	1	1	1	0	1	1	1	1	1	1	
482	01	000.1+00.0L14		0	1	0	1	0	1	1	0	1	0	0	1	0	
483	01	000.1+00.0M14		0	1	0	1	0	1	1	0	1	0	0	1	0	
484	01	000.1-06.4L14		0	1	0	1	0	1	1	0	1	0	0	1	0	
485	01	000.5+00.0L10	OVERRIDE	0	1	0	1	0	1	1	0	1	0	0	1	0	*
486	01	000.1+06.4M14		0	1	0	1	0	1	1	0	1	0	0	1	0	
487	64	040.0-06.4L14		0	1	0	1	1	1	0	1	1	1	1	1	1	
489	01	000.1-06.4M14		0	1	0	1	0	1	1	0	1	0	0	1	0	
490	01	000.1+12.1H14		0	1	0	1	0	1	1	0	1	0	0	1	0	
491	01	004.0-44.7H14		0	1	0	1	0	1	1	0	1	0	1	1	1	
492	01	006.0+45.4H14		0	1	0	1	0	1	1	0	1	0	1	1	1	
493	01	001.5-06.4L10		0	1	0	1	0	1	1	0	1	0	0	0	1	*
494	64	015.5-06.4L10		0	1	0	1	1	1	0	1	1	1	0	0	1	*
495	01	000.5-06.4L10	OVERRIDE	0	1	0	1	0	1	1	0	1	0	0	1	0	*
496	01	000.1-06.4H14		0	1	0	1	0	1	1	0	1	0	0	1	0	
497	01	005.0+00.0L14		0	1	0	1	0	1	1	0	1	0	1	0	0	
498	01	008.0+00.0M14		0	1	0	1	0	1	1	0	1	0	1	1	1	
499	01	006.0+02.1L14		0	1	0	1	0	1	1	0	1	0	1	1	1	

DSPC NO.3 2ND WORD

BIT PATTERNS

P.W A.O R.R I.D T. Y.D .E 1.F T. O.B 2.I 3.T . (PARITY 1 TO 23 / WORD DEF. BIT)

ROLL RATE *

.P .A .R .I .T .Y . .1 . .TO . .36 (PARITY 1 TO 36)

[T2-T1] — ROLL ANGLE — ROLL ANGLE — GFE 1-C8 TO GFE 1-C12

1	2	3	4	5	6	7	8	9	10	11	12.	13	14	15	16	17	18.	19	20	21	22	23	24.	25	26	27	28	29	30.	31	32	33	34	35	36.	37	
+0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	1	0	0	0	0	1	0	1	1	1	465
1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	1	1	0	466
0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0	1	1	0	467
1	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	0	468
+1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	1	1	1	469
1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	470
1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	0	0	471
0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	1	0	1	1	0	472
+0	1	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	0	0	473
1	1	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	474
1	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	1	1	1	0	0	1	476
0	1	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	477
+1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0	0	478*
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	479*
0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	1	0	0	0	480
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	481
+1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	482
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1	1	0	0	1	483
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1	0	0	0	1	1	0	0	1	484
0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	1	485*
+1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	1	0	0	1	0	1	1	0	0	0	486
1	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0	0	1	1	0	0	1	487
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1	0	1	0	1	1	0	0	0	489
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	1	1	0	1	1	0	0	1	490
+1	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	0	1	491
0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	1	0	0	1	492
0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1	0	0	0	1	0	0	0	0	493*
1	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0	0	1	0	0	0	0	494*
+0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	1	0	0	0	1	0	0	0	0	495*
1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	1	0	0	1	1	1	0	1	1	0	0	1	496
1	1	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	1	0	0	0	497
1	1	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	1	1	0	0	1	498
+0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	1	0	0	0	0	1	1	0	0	0	499

THE FOLLOWING IS A LIST OF COMMAND NUMBERS AND THE NUMBERS OF THE SEQUENCES IN WHICH THEY ARE USED. THIS LIST IS FOR STORED PROGRAM COMMAND NUMBERS FROM 170 THRU 499.

CMD NO.		SEQUENCE NUMBER									
189	-	146	155	156							
190	-	114	119								
192	-	104	147	149	155	156					
194	-	150									
201	-	107	111								
203	-	109	110								
206	-	107	109								
211	-	110	111	130	146	147					
213	-	107	128								
217	-	109	110	128							
219	-	101	102	103	104						
220	-	147									
232	-	147									
233	-	103									
237	-	130									
253	-	119									
262	-	137									
263	-	157									
267	-	112	137								
277	-	124	125								
281	-	115	116	117	131	132	135	140	142		
283	-	104	106								
284	-	114	119	121	124	125	127	152			
285	-	122	123	126	136	150	157				
286	-	106	112	114	115	116	117	119	121	122	123
	-	124	125	127	131	132	135	137	140	142	144
	-	145	146	147	149	152	154	158			
288	-	136									
291	-	105	107	109	110	111	149				
299	-	128									
300	-	138	139	150	151	158					
301	-	158									
303	-	140	141	142							
304	-	144	145	149							
305	-	148	149								
309	-	105	106								
310	-	132									
312	-	105	106	132	135	140	142	147			
313	-	131	140	144	145						
314	-	131	140	151							
315	-	146	147								
316	-	147									
318	-	153									

CONTINUE

319 - 146	147								
320 - 158									
321 - 121	127	131	132	140	146	149	150	152	154
- 158									
322 - 131	132	140	142	147	151				
323 - 105	133	134	136	140	141	149	151	153	
324 - 136	143								
325 - 149									
326 - 134	146	147							
328 - 144	145								
329 - 149									
332 - 105	106								
333 - 140	141	146	147	150	151				
334 - 126									
337 - 146	147	150							
338 - 133	146	147							
339 - 121	127	152							
345 - 135	154								
346 - 148									
347 - 142									
348 - 148									
349 - 126									
351 - 126									
370 - 105									
371 - 138	139	140	141	142	150	151	157	158	
372 - 106									
374 - 127									
375 - 106									
376 - 152									
377 - 144	145	148							
378 - 106									
379 - 148	149								
380 - 148	149								
381 - 105	106	135							
383 - 124									
385 - 105	106	115	116	117	135				
386 - 133	146	147	149						
388 - 138	140	141	142	150	151	158			
389 - 105	106	119	125	153	154	157			
391 - 106									
392 - 115	116	117							
395 - 105									
396 - 106									
397 - 134	135	146	147	149	150	151			
398 - 144	145								
399 - 117	153	154							
400 - 133	146	147							
401 - 149									
402 - 124	125	136							
456 - 136									

CONTINUE

```
465 - 136
466 - 136
467 - 136
468 - 136
469 - 126
471 - 126
472 - 126
473 - 126
474 - 126
476 - 126
477 - 126
478 - 143
479 - 143
480 - 126
482 - 104  105  106  131  132  133  134  135  140  142
    - 146  147  149  151
484 - 137  140  142
485 - 130
487 - 121
493 - 123
494 - 122
497 - 155  156
```

THE FOLLOWING IS A LIST OF COMMAND NUMBERS NOT USED IN ANY SEQUENCE.

```
185  186  187  188  191  193  195  196  197  198
199  200  202  204  205  207  208  209  210  212
214  215  216  218  231  234  235  236  238  254
255  256  257  258  259  260  261  264  265  266
268  269  270  271  272  273  274  275  276  278
279  280  282  287  289  302  311  317  327  330
331  335  340  341  342  343  350  352  353  357
373  382  384  387  393  394  403  450  451  452
453  454  455  457  470  481  483  486  489  490
491  492  495  496  498  499
```

DIN: SVS 5329 Rev H Addendum 1

Dated: 5/23/67

Total Pages: 7

ADDENDUM 1 TO COMMAND DEFINITION SPECIFICATION CONFIGURATION I-38

Prepared by H. Rosenblum

H. Rosenblum, Command & Control Systems

Approved by T. A. Goodwyn Jr.

T. A. Goodwyn, Jr., Manager, Command & Control Systems

Issued by Charles J. Broomall 5-24-67

Specification Control

GENERAL ELECTRIC

SVS 5329

LIST OF EFFECTIVE PAGES

This document contains 7 pages, consisting of the following:

1. Vehicle 988 will have the "redundant pneumatic system." The "redundant pneumatic system" has a low thrust system and a high thrust system which may be operated together or each one separately. Normal operation is to have both systems enabled with roll maneuvers accomplished the same as 987, i.e.:

Low $t = \frac{\Delta\theta}{0.26} + 3.0$ seconds

Med $t = \frac{\Delta\theta}{1.61} + 1.6$ seconds

High $t = \frac{\Delta\theta}{3.12} + 2.6$ seconds

2. If there is a malfunction of either the high or low thrust system, then the offending system will be disabled and the operation will continue, but with a change in the roll maneuver equations. (In the case of a gas leak, the good system will probably be disabled until the leakage has stopped or the gas in the leaking systems has been expended in order to preserve the gas in the good system which would otherwise attempt to compensate for the leak.)

3. Low Thrust System Only - (RMA/High Thrust Disabled)

   a. In the event of a malfunction in the high thrust system, RTC 11 would be sent to disable the RMA and high thrust system. With the RMA and High Thrust System Disabled by RTC 11, the vehicle is not able to perform medium or high rate roll maneuvers. However, roll maneuvers may be accomplished using the low thrust nozzles in either fine deadband with a 0.26°/sec. coast rate, or in coarse deadband with a 0.69°/sec. coast rate. Using roll coarse deadband during roll maneuvers then results in a "pseudo medium" rate maneuver.

   b. When using the "pseudo medium" rate maneuver, it is necessary to command roll coarse deadband, rate roofs off, just prior to commanding the new roll angle. Pitch and yaw are left in fine deadbands. It is also necessary to command roll fine deadband, rate roofs on, when the vehicle is 3.3° from the commanded angle, nominally 20 seconds prior to full completion. This 20 seconds allows for deceleration and settling within the rate roofs box.

   c. The obvious advantage of using the "pseudo medium" rate maneuver is to reduce the time for making roll maneuvers. A 30° maneuver requires 120 sec. with a low rate and 60.5 sec. with a "pseudo medium" rate. The disadvantages are two extra commands needed for each roll maneuver (RC RT- just prior to new angle command, and RF RT+ 20 seconds prior to full completion) and the increased gas usage.

d. Therefore, the resulting software equations for roll maneuvers in the degraded mode with low thrust only are:

Low $$t = \frac{\Delta\theta}{0.26} + 4.0 \text{ seconds}$$

"Pseudo Medium" $$t = \frac{\Delta\theta}{0.69} + 17 \text{ seconds}$$

$$t_f = \left[\frac{\Delta\theta}{0.69} + 17\right] - 20 \text{ seconds}$$

Where the "pseudo medium" is executed with RC RT- and t_f is the time when RF RT+ is commanded. "Pseudo medium" may be used only for $\Delta\theta$ greater than 5.7°.

High — No capability to perform high rate maneuvers since the RMA is disabled.

4. <u>High Thrust System Only</u> - (RMA/Low Thrust Disabled)

a. In the event of a malfunction in the low thrust systems, RTC 12 would be sent to disable the RMA and low thrust system. With the RMA and Low Thrust System Disabled by RTC 12, the vehicle is not able to perform medium or high rate roll maneuvers. RTC 12 also switches the output of the roll ACA high thrust solenoid drivers from the roll high thrust nozzles to the roll high thrust backup nozzles which have restrictors and produce a thrust level equivalent to a roll low thrust nozzle (0.13 lb). Roll is also automatically set to coarse deadbands by taboo logic while pitch and yaw may be commanded to coarse or fine as desired.

b. Therefore, the resulting software equations for roll maneuvers in the degraded mode with high thrust only are:

Low $$t = \frac{\Delta\theta}{0.69} + 35.0 \text{ seconds}$$

Med

High

There is no capability to perform medium or high rate maneuvers since the RMA is disabled.

5. Attached is a list of sequences in the Command Definition Specification Configuration I-38 (DIN: SVS 5329 Rev. H), that need revising to allow operation in each of the degraded modes.

SEQ. NUMBER	TITLE	RTC 11 LOW THRUST (Sets All Three ACA's In Low Thrust)	RTC 12 HIGH THRUST (Sets All Three ACA's In High Thrust)
105	Acquire Tumble	Change 332 to low thrust	(1) Change 332, 309, 312, 323 to high thrust (2) Change RT+ to RT-
106	Acquire Forward	Change 332 to low thrust	(1) Change 332, 309, 312 to high thrust (2) Change RT+ to RT-
121	TC Test		(1) Change 339, 321 to high thrust
126	Health Check		(1) Change 351, 349, 334 to high thrust (2) Change RT+ to RT- (3) Change fine deadbands to coarse deadbands
127	FA Exercise		(1) Change 339, 321 to high thrust
131	Yaw Around to Reverse		(1) Change 321, 322, 314, 313 to high thrust
132	Yaw Around to Forward		(1) Change 321, 322, 312, 310 to high thrust
133	Down	Change 338 to low thrust	(1) Change 338, 323, to high thrust
134	Up	Change 326 to low thrust	(1) Change 326 to high thrust
135	AC Backup Special		(1) Change 345, 312 to high thrust
136	Roll Matrix		(1) Change 324, 323 to high thrust (2) Change RT+ to RT- (3) Fine deadbands to coarse
140	Orbit Adjust-1	Change 333 to low thrust	(1) Change 321, 322, 314, 313, 323, 312 to high thrust (2) Change fine deadbands to coarse

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SEQ. NUMBER	TITLE	RTC 11 LOW THRUST (Sets All Three ACA's In Low Thrust)	RTC 12 HIGH THRUST (Sets All Three ACA's In High Thrust)
141	Orbit Adjust-2	Change 333 to low thrust	(1) Change 323 to high thrust (2) Change fine deadbands to coarse
142	Orbit Adjust-3	Change 347 to low thrust	(1) Change 322, 312 to high thrust (2) Change fine deadbands to coarse
143	Gas Depletion		(1) Change 324 to high thrust (2) Change RT+ to RT- (3) Change fine deadbands to coarse
144	Disconnect 1		(1) Change 328, 313 to high thrust
145	Disconnect 2		(1) Change 328, 313 to high thrust
146	Alternate Separate	Change 338, 326 to low thrust	(1) Change 338, 337, 326, 321 to high thrust (2) Change fine deadbands to coarse
147	Separate	Change 338, 326 to low thrust	(1) Change 338, 337, 326, 322, 312 to high thrust (2) Change fine deadbands to coarse
148	Secure		(1) Change 348 to high thrust (2) Change fine deadbands to coarse
149	Emergency RV Recovery	Change 329, 325 to low thrust	(1) Change 321, 323 to high thrust
150	OCV Deboost-AC	Change 333 to low thrust	(1) Change 321, 337 to high thrust (2) Change fine deadbands to coarse
151	Emergency OCV Deboost	Change 333 to low thrust	(1) Change 322, 314, 323 to high thrust (2) Change fine deadbands to coarse
152	RA Exercise		(1) Change 339, 321 to high thrust
153	IR Dormancy (R1-)		(1) Change 318, 323 to high thrust

SEQ. NUMBER	TITLE	RTC 11 LOW THRUST (Sets All Three ACA's In Low Thrust)	RTC 12 HIGH THRUST (Sets All Three ACA's In High Thrust)
154	IR Dormancy (R1+)		(1) Change 345, 321 to high thrust
158	BUSS Execution (E+)		(1) Change 320, 321 to high thrust

APPENDIX 19

OPERATIONAL SOFTWARE/HARDWARE CONSIDERATIONS AND LIMITATIONS SPECIFICATION

CONFIGURATION I-38 AND SUBSEQUENT

DIV- SVS 5318 REV. D

OPERATIONAL SOFTWARE / HARDWARE CONSIDERATIONS AND LIMITATIONS SPECIFICATION.

CONFIGURATION I-38 AND SUBS (U)

PREPARED BY - H. Rosenblum
H. ROSENBLUM
COMMAND AND CONTROL SYSTEMS

APPROVED BY - T.A. Goodwyn Jr
T.A. GOODWYN - MANAGER
COMMAND AND CONTROL SYSTEMS

ISSUED BY - C. L. Carey 5/19/67
SPECIFICATION CONTROL

GENERAL ELECTRIC

LIST OF EFFECTIVE PAGES

This document contains 20 pages, consisting of the following:

Title

1 through 19

INTRODUCTION

THE FOLLOWING DOCUMENT CONTAINS [A] GENERAL DESCRIPTIVE BACKGROUND DATA ON THE COMMAND AND CONTROL SYSTEM AND ITS ASSOCIATED SOFTWARE AND, [B] OPERATIONAL CONSIDERATIONS AND LIMITATIONS OF THE HARDWARE-SOFTWARE INTERFACE FOR VEHICLE 988 AND SUBSEQUENT. THIS IS A VEHICLE-SPECIFIC DOCUMENT TO BE REFERRED TO IN CONJUNCTION WITH THE CURRENT "COMMAND DEFINITION SPECIFICATION".

I. GENERAL

1 COMMAND TRANSMISSION

THE PRIMARY OUTPUT OF THE COMMAND AND CONTROL COMPUTER PROGRAM IS A CODED PAPER TAPE WHICH IS SENT TO ONE OR MORE SPECIFIED TRACKING STATIONS FOR TRANSMISSION TO THE ORBITING VEHICLE. THIS TAPE CONTAINS COMMANDS WHICH CONTROL THE OPERATIONAL FUNCTIONS OF THE VEHICLE IN THE PERFORMANCE OF THE MISSION.

THE SPECIALLY FORMATTED TAPES ARE SENT VIA TELETYPE FROM THE STC TO THE DESIGNATED TRACKING STATION[S] WHERE REPLICAS ARE GENERATED. THE COMMANDS [TAPES] ARE IMMEDIATELY RETRANSMITTED AND VERIFIED AT THE STC. ALTERNATE TRANSMISSION MEDIA CAN ALSO BE UTILIZED AS EXPEDIENCY DICTATES.

WHEN A TAPE IS CORRECTLY RECEIVED AT A STATION, IT IS TRANSLATED INTO VEHICLE RECOGNIZABLE BIT PATTERNS AND SENT BY VERLORT RADAR TO THE S/V. THE INDIVIDUAL COMMANDS ARE SENT ONE WORD AT A TIME IN A SERIAL MANNER.

THE PULSE POSITION DEMODULATOR CONVERTS THE VERLORT DATA TO 1,0,S NRZ FORM, DETERMINES IF IT IS ACCEPTABLE, AND IF SO, SENDS IT TO THE COMMAND DECODER.

2 COMMANDS

2.1 COMMAND DEFINITION

THE VEHICLE ACCEPTS 3 TYPES OF COMMANDS.

[A] REAL TIME COMMANDS [RTC] - ONE 7 BIT WORD.

[B] STORED PROGRAM COMMANDS [SPC]

1. SINGLE STORED PROGRAM COMMANDS [SSPC] - ONE 37 BIT WORD.

2. DOUBLE STORED PROGRAM COMMANDS [DSPC] - TWO 37 BIT WORDS.

[C] HYBRID COMMANDS - ONE 37 BIT WORD.

MANY POSSIBLE FUNCTION BIT COMBINATIONS EXIST FOR EACH TYPE OF SPC. HOWEVER, ONLY A FEW COMBINATIONS OF THE FUNCTION BITS WOULD NORMALLY BE USED TO CONTROL THE VEHICLE OPERATIONS. MISSION STUDIES HAVE RESULTED IN A CATALOG OF FEASIBLE FUNCTION BIT COMBINATIONS. WHEN THESE ARE COMBINED WITH THE REST OF THE STRUCTURE IN DSPC-S AND SSPC-S THE RESULTING COMPLETE SSPC OR DSPC WORD IS CALLED A -COMMAND-. A TABLE OF DEFINED COMMANDS TOGETHER WITH A COMMAND DESCRIPTOR AND NUMERICAL DESIGNATOR FOR EXTERNAL REFERENCE IS STORED IN THE PERMANENT MEMORY SECTION OF THE COMPUTER PROGRAM [MPES]. THE COMMAND DESCRIPTOR, WHICH IS LIMITED TO 40 CHARACTERS INCLUDING SPACES, IS COMPOSED OF FUNCTION ABBREVIATIONS THAT COMPLETELY DEFINE THE VEHICLE STATUS FOR A GIVEN COMMAND TYPE.

PRESENTLY THERE ARE APPROXIMATELY 200 DEFINED COMMANDS. EITHER THE COMMAND NUMBER OR THE EVENT DESCRIPTOR DEFINES AN INDIVIDUAL COMMAND, DIFFERENT IN BIT STRUCTURE FROM ALL THE OTHER COMMANDS.

2.2 REAL TIME COMMANDS [RTC]

WHEN A REAL TIME COMMAND IS RECEIVED BY THE COMMAND DECODER IT IS EXECUTED IMMEDIATELY. CONSEQUENTLY, RTC-S ARE USED TO ASSIST REGULAR PROGRAMMED OPERATION OF THE VEHICLE OVER A TRACKING STATION.

2.3 STORED PROGRAM COMMANDS [SPC]

WHEN AN SPC IS RECEIVED BY THE COMMAND DECODER IT IS STORED IN ONE OF FOUR [4] RECIRCULATING DELAY LINES, WHICH CONSTITUTE THE PROGRAMMER MEMORY, FOR EXECUTION AT A SPECIFIED VEHICLE TIME. VEHICLE TIME IS COUNTED BY A 23 BIT CLOCK WITH ONE TENTH OF A SECOND GRANULARITY. WHEN THE TIME LABEL [BIT POSITIONS 1 TO 23] OF AN SSPC OR OF THE 1ST WORD OF A DSPC MATCH THE CONTENTS OF THE VEHICLE CLOCK, THE ASSOCIATED COMMAND IS READ OUT OF THE LINES, SENT TO THE COMMAND DECODER, AND EXECUTED. EACH DELAY LINE OF THE STORAGE PROGRAMMER CAN STORE UP TO 99-37 BIT WORDS.

A DOUBLE STORED PROGRAM COMMAND [DSPC] IS COMPOSED OF 2-37 BIT WORDS WHICH ARE STORED SEQUENTIALLY IN ONE DELAY LINE.

2.4 HYBRID COMMANDS

HYBRID COMMANDS ARE SO NAMED SINCE THEY RESEMBLE SPC COMMANDS IN BIT STRUCTURE BUT ARE EXECUTED IN REAL TIME AS ARE THE RTC-S.

3 HARDWARE CONSIDERATIONS

THE COMMAND DECODER EXTRACTS TWO [2] CONSECUTIVE 37-BIT WORDS IN A PARTICULAR DELAY LINE FROM THE STORAGE PROGRAMMER WHEN THE TIME TAG OF THE FIRST WORD CORRESPONDS WITH THE VEHICLE CLOCK. SINCE THE HARDWARE MUST EXTRACT TWO [2] WORDS IN ORDER TO FUNCTION PROPERLY, CARE MUST BE EXERCISED TO PREVENT THE LAST COMMAND LOADED INTO A DELAY LINE FROM BEING AN SSPC. IF THE LAST COMMAND IN A LINE IS AN SSPC, IT WILL NEVER BE EXECUTED. TO PREVENT THIS CONDITION FROM OCCURRING A -DUMMY- COMMAND [NO.290] HAS BEEN DEFINED. THIS -DUMMY- WILL BE APPENDED [BY THE COMPUTER PROGRAM] AS THE LAST COMMAND. ITS TIME TAG AND FUNCTION BITS ARE DEFINED SUCH THAT NO VEHICLE INTERPRETATION WILL RESULT. THE ONLY OTHER COMMAND WORD THAT COULD MEANINGFULLY OCCUPY CELL NO. 99 WOULD BE THE 2ND WORD OF A DSPC.

THE VEHICLE COMMAND SYSTEM IDENTIFIES THE COMMAND BY THE 3 BIT DECODER INPUT ADDRESS WHICH IS UNIQUE FOR EACH OF THE 2 SSPC-S AND 6 DSPC-S.

4 SEQUENCES

IT HAS ALSO BEEN OBSERVED THAT CERTAIN COMBINATIONS OF COMMANDS REPRESENT AN OFT-REPEATED VEHICLE OPERATION. THIS IS TRUE FOR YAW MANEUVERS, DEBOOST, ORBIT ADJUSTS, STATION PASS, AND THE LIKE. THESE GROUPS OF RELATED COMMANDS HAVE BEEN DESIGNATED AS -SEQUENCES-. OPERATIONAL STUDIES BY COGNIZANT DESIGN AND SYSTEM ENGINEERS HAVE ESTABLISHED THE EVENT TIME TAG RELATIONS UPON WHICH THE PARTICULAR VEHICLE OPERATION IS BASED.

SEQUENCES ARE, IN TURN, FURTHER CLASSIFIED AS -MAJOR- AND -MINOR- TYPES. MAJOR SEQUENCES MAY CONTAIN ANYWHERE FROM 2 COMMANDS AND RELATED TIME TAGS TO POSSIBLY 20 OR 30 COMMANDS AND RELATED TIME TAGS. DUE TO THE REPEATED USAGE OF CERTAIN SMALL SERIES OF COMMANDS WITHIN THE -MAJOR- SEQUENCES THERE IS AN INTERMEDIATE GROUPING OF COMMANDS INTO THE SO CALLED -MINOR- SEQUENCES. GREATER PROGRAM VERSATILITY IS GIVEN THE COMMAND GENERATOR BY USING GROUPS OF THESE -MINOR- SEQUENCES TO TAILOR A VEHICLE MANEUVER TO PARTICULAR MISSION CONDITIONS. THE PROGRAM 206 COMMAND STRUCTURE IS SUCH THAT EACH COMMAND OF A GIVEN TYPE [DSPC-1, 2, ETC.] IS RELATED VEHICLE STATUS-WISE WITH THE IMMEDIATELY PRECEEDING AND FOLLOWING COMMANDS OF THIS SAME TYPE. THIS RELATIONSHIP CAN BE OBSERVED BY EXAMINING THE INTERRELATIONS OF COMMANDS IN A SEQUENCE. A BIT FOR BIT COMPARISON OF THESE TIME-BORDERING COMMANDS SHOWS THE NECESSARY VEHICLE-FUNCTION COMPATIBILITY REQUIRED TO PERFORM THE DESIRED OPERATION.

THE COMMAND GENERATOR HAS THE CAPABILITY TO DEFINE NEW COMMANDS AND SEQUENCES AS THE OCCASION WARRANTS. SPECIAL PROBLEMS OR UNFORSEEN CONDITIONS WILL UNDOUBTEDLY ARISE WHEN THIS OPTION WILL BE NEEDED. ONLY THE MOST COMMON OR FORESEEABLE VEHICLE SEQUENCES HAVE BEEN ANTICIPATED AND DEFINED.

II. OPERATIONAL CONSIDERATIONS AND LIMITATIONS

1. COMMAND COMBINATIONS NOT TO BE LOADED.

*1.1 ROLL AXIS - FINE DEADBAND, HIGH THRUST. TABOO LOGIC CAUSES COARSE ROLL DEADBANDS WHENEVER THE HIGH THRUST LEVELS ARE IN OPERATION. THE DEADBANDS WILL SUBSEQUENTLY REMAIN COARSE UNTIL COMMANDED TO FINE UNDER NON-TABOO CONDITIONS.

*1.2 PITCH OR YAW AXIS - FINE DEADBAND, HIGH THRUST, RATE ROOFS ON. TABOO LOGIC CAUSES THE FINE DEADBAND RATE ROOFS TO BE REMOVED WHENEVER HIGH THRUST LEVELS ARE IN OPERATION. THE RATE ROOFS WILL REMAIN OFF UNTIL COMMANDED ON UNDER NON-TABOO CONDITIONS.

*1.3 RMA ENABLED, MEDIUM MANEUVER RATE, ROLL COARSE DEADBAND. TABOO LOGIC DISABLES THE RMA AT THE CONCLUSION OF A ROLL MANEUVER, RETURNING CONTROL TO THE RACA.

*1.4 IR- OR AC- AFTER THEY HAVE BEEN COMMANDED ON. TWO COMMANDS, IOE+ AND ABE+ RESPECTIVELY ARE NECESSARY TO ENABLE THE TURNING OFF OF THESE FUNCTIONS, THERBY LESSENING THE CHANCE OF INADVERTENT OPERATION. ABE+ IS ALSO THE ENABLE FOR BUSS EXECUTE.

*1.5 YAW TORQUING ON, YAW FINE DEADBAND. TABOO LOGIC SWITCHES YAW DEADBANDS TO COARSE WHEN YAWING TORQUE IS ON. THE DEADBAND REMAINS COARSE UNTIL COMMANDED FINE UNDER NON-TABOO CONDITIONS [TQ-].

*1.6 FLY REVERSE, PITCH FINE DEADBAND, RATE ROOFS ON.

*1.7 PITCH MOTION FROM A ROLLED ATTITUDE OR ROLL MOTION FROM A PITCHED ATTITUDE. EXECUTION OF PREDAC BYPASS COMMAND [BY] AT LEAST 180 SEC. BEFORE PITCH DOWN [PD] INSURES A ZERO ROLL ATTITUDE. THE PITCHDOWN COMMAND ITSELF FORCES ANY NON-ZERO ROLL COMMANDS TO BE IGNORED UNTIL PITCH ZERO IS COMMANDED. PITCH ZERO TAKES -BY- FUNCTION OFF AND THE VEHICLE WILL ASSUME THE LAST COMMANDED ROLL ATTITUDE.

1.8 YAWING TORQUE ON AT SUNSET OR SUNRISE.

1.9 YAWING TORQUE ON WITH EITHER IR OFF OR SEARCH MODE ON.

1.10 PITCH DOWN, YAWING TORQUE ON.

1.11 PITCH MOTION IN LOW COARSE OR HIGH FINE DEADBANDS.

* THESE RESTRICTIONS ARE CHECKED FOR BY GCOMPAT. WHERE TABOO LOGIC PREVENTS THE OCCURENCE OF THESE MODES THE COMMAND LOAD SHOULD STILL BE MODIFIED TO ASSURE THAT THE COMMAND LISTS DEPICT THE ACTUAL VEHICLE STATUS.

2. YAW TIMING

*2.1 STABILIZATION TIME OF THE VEHICLE TO ALLOWABLE O.A. LIMITS FOLLOWING THE COMPLETION OF A YAW MANEUVER IS AT LEAST 496 SEC. [FROM F+]. [I.E., NO POWERED MOTION OF VEHICLE SHOULD BE ATTEMPTED DURING THIS PERIOD].

2.2 WHEN EXECUTING A YAW MANEUVER, THE -YAW TORQUE ON- COMMAND MUST BE FOLLOWED BY A - FLY FORWARD- OR -FLY REVERSE- COMMAND [AS APPLICABLE] 450 SECONDS LATER AND AT NO OTHER TIME. IF -FLY REVERSE- IS COMMANDED VIA A DSPC-5 COMMAND THEN A DSPC-4 -YAW TORQUE OFF- COMMAND MUST ALSO BE GIVEN WITHIN A FEW SECONDS, BUT GCOMPAT DOES NOT CHECK FOR THE LATER CONDITION. FOLLOWING THE MANEUVER, -YAW TORQUE OFF- IS REQUIRED AND SHOULD BE DEFINED WITHIN THE DSPC-4 COMMAND WHICH GIVES THE -FLY- ORIENTATION.

3. PITCH TIMING

STABILIZATION TIME OF THE VEHICLE FOLLOWING A PITCH COMMAND SHOULD BE AT LEAST 100 SECONDS IN COARSE DEADBAND MODE AND 240 SECONDS IN FINE DEADBAND MODE. GCOMPAT CHECKS FOR 240 SECONDS BETWEEN PITCH DOWN OR ZERO COMMANDS AND GFE COMMANDS, AND FOR 250 SECONDS BETWEEN PITCH DOWN OR ZERO AND ENGINE ON COMMANDS.

4. ROLL MANEUVER TIMES

4.1 A MANEUVER OF 0.709 DEGREES SHOULD BE PERFORMED IN LOW AND TAKES A TOTAL TIME OF 5.5 SECONDS. THE MINIMUM DELTA THETA FOR THE HIGH RATE IS 4.963 DEGREES.

STABILIZATION VALUES FOR A REAL TIME ROLL MANEUVER SEQUENCE ARE-

HIGH- T[H]=[DEL THETA/3.12]+2.6 SECONDS

MED- T[M]=[DEL THETA/1.61]+1.6 SECONDS

LOW- T[L]=[DEL THETA/0.26]+3.0 SECONDS

WHERE DEL THETA=DELTA ROLL ANGLE.

4.2 LOW ROLL MANEUVERS WITHOUT RATE ROOFS-

LOW ROLL MANEUVERS IN FINE LIMIT CYCLE WITH RATE ROOFS OFF ARE PERMISSABLE. SINCE THE SETTLING TIME IS LONGER THE FOLLOWING EQUATION APPLIES TO THIS MANEUVER.

T[L]=[DEL THETA/0.26]+9.2 SECONDS

IT IS RECOMMENDED THAT MEDIUM AND HIGH RATE MANEUVERS NOT BE PERFORMED WITHOUT RATE ROOFS.

* THESE RESTRICTIONS ARE CHECKED FOR BY GCOMPAT.

4.3 IF A HIGH OR MEDIUM RATE ROLL MANEUVER IS TO BE FOLLOWED BY A LOW ROLL MANEUVER, SUFFICIENT TIME MUST BE ALLOWED TO COMPLETE THE INITIAL ROLL. IF INSUFFICIENT TIME IS AVAILABLE, THEN LOW NOZZLES WILL BE REQUIRED TO STOP THE HIGH OR MEDIUM ROLL RATE BEFORE PROCEEDING TO THE PROPER ANGLE. THIS WILL CREATE EXCESSIVE GAS CONSUMPTION AND A LARGE ANGULAR POSITION ERROR THAT COULD DUMP THE PLATFORM AND CAUSE LOSS OF ACQUISITION FOR AS LONG AS 3 ACTIVE REVS.

5. PC TIMER CONSIDERATIONS

5.1 WHEN AN SPC COMES UP FOR EXECUTION, AND THE C.D. IS OFF, THE C.D. WILL BE ACTIVATED IN THE -REAL TIME- MODE AND COMMAND WILL EXECUTE. THE COMMAND DECODER NOW WILL REMAIN -ON- IN THE -6-MINUTE RESETTABLE MODE-. IF THE COMMAND DOES NOT PLACE IT IN ANOTHER MODE (SEE PARAGRAPH 5.4).

5.2 EACH COMMAND OCCURING THEREAFTER, WITHIN 6 MINUTES, WILL RESET THE TIMER TO RUN ANOTHER 6 MINUTES. THE TIME TOLERANCE OF THIS TIMER IS 6 MINUTES +/- 45 SECONDS. IF A COMMAND IS DUE FOR EXECUTION DURING THE TOLERANCE INTERVAL, IT MAY NOT EXECUTE. FOR THIS REASON THE COMMAND [291], TIMER RESET, WAS DEFINED. IT SHOULD BE INSERTED PRIOR TO THE TOLERANCE INTERVAL IF ANOTHER COMMAND IS WITHIN THE INTERVAL. THIS RESET WILL KEEP THE C.D. -ON- SUCH THAT ANY COMMANDS IN THIS QUESTIONABLE AREA WILL NOT BE IGNORED.

5.3 TURNOFF OF THE P.C. ALSO TURNS OFF THE FLIGHT RECORDER. IN ORDER TO RECORD FOR PERIODS GREATER THAN 6 MINUTES, COMMAND NO. 291 MAY BE REQUIRED TO RESET THE P.C. TIMER. RECORDER PERIODS SHOULD NOT BE SHORTER THAN 1 (ONE) SECOND TO AVOID TOO MUCH TENSION ON TAPE.

IF TEN 1-SECOND RECORDER PERIODS OCCUR CONSECUTIVELY, EXCESSIVE TENSION SHOULD BE REMOVED FROM THE TAPE. THIS CAN BE DONE BY COMMANDING A 4 MINUTE R1+ MODE OR 1 MINUTE R2+ MODE. RECORDING (RECORDER MODE 1) DURING A REAL TIME TM STATION PASS SHOULD BE AVOIDED. THE DATA RECORDED IN THIS MANNER MAY BE DEGRADED. RECORDER HIGH SPEED PLAYBACK (RECORDER MODE 2) IS THE PRIMARY MODE OF OPERATION OF THE FLIGHT RECORDER- I.E. IF RECORDER MODE 1 IS IN PROGRESS AND RECORDER MODE 2 IS COMMANDED, MODE 2 OPERATION WILL RESULT. FURTHERMORE, IF RECORDER MODE 2 OPERATION IS COMMANDED -OFF-, MODE 1 OPERATION WILL IMMEDIATELY RESUME UNTIL TURNED OFF BY COMMAND OR P.C. TIMER CYCLE.

5.4 THE FOLLOWING DEMONSTRATES THE POWER CONTROLLER TIMER OPERATION.

THE TABLE BELOW IS IN THE FAMILIAR DECISION TABLE FORM WHERE ANY HORIZONTAL LINE A, B, C, D INDICATES THAT-
IF THE PRESENT TIMER MODE IS [A] AND THE COMMAND IS [B], THEN THE RESULTING TIMER MODE IS [C] AND THE REMAINING TIME EQUALS [D], WHERE X EQUALS THE REMAINING TIME PREVIOUS TO THE PRESENT COMMAND.
NOTE- POA [POWER ON ALERT] INDICATES STORED COMMANDS OTHER THAN AN SSPC-2 WHICH CONTAINS THE TIMER CONTROL BITS.

[A] PRESENT P.C. TIMER MODE	[B] COMMAND	[C] RESULTING MODE	[D] REMAINING TIME
OUT	POA	6R	6
OUT	6	6F	6
OUT	6R	6R	6
OUT	12+POA	12R	12
OUT	CD-	6R	6
6R	POA	6R	6
6R	6	6F	6
6R	6R	6R	6
6R	12+POA	12R	12
6R	CD-	6R	6
6F	POA	6F	X
6F	6	6F	X
6F	6R	6F	X
6F	12+POA	12F	X + 6
6F	CD-	6F	X
12R	POA	12R	12
12R	6	12F	12
12R	6R	12R	12
12R	12	12R	12
12R	CD-	12R	12
12F	POA	12F	X
12F	6	12F	X
12F	6R	12F	X
12F	12	12F	X
12F	CD-	12F	X

5.5 P.C. TIMER RUNOUT DOES -NOT- AFFECT THE P.B. SUBSYSTEM IN ANY WAY.

5.6 A TWELVE [12] MINUTE RESETTABLE COMMAND MUST BE FOLLOWED BY A SECOND POA [PRIOR TO 6 MINUTE TIME-OUT] TO PROVIDE FOR COMMAND EXECUTION OF THE 12-MINUTE RESETTABLE MODE.

5. COMMAND HARDWARE

5.1 SPC LOCKOUT

STORED PROGRAM COMMANDS [SPC-S] WILL NOT EXECUTE WHEN THE COMMAND DECODER [C.D.] IS IN THE -STORAGE MODE- [I.E., WHEN COMMANDS ARE BEING LOADED]. FOR EXECUTION SPC-S REQUIRE THE VEHICLE TO BE IN A -REAL TIME- MODE. CONSEQUENTLY, THE VEHICLE SHOULD BE SENT THE -REAL TIME ENABLE- COMMAND UPON COMPLETION OF A COMMAND LOAD FROM A TRACKING STATION. IMPLICATIONS OF THE ABOVE ARE- IF A GIVEN STATION PASS COMMAND LOAD IS ONLY PARTIALLY COMPLETED DUE TO EQUIPMENT FAILURE OR TRANSMISSION DIFFICULTIES, THE 0 DEGREE CONE -TT+C OFF- COMMAND WILL NOT EXECUTE [THIS IS USUALLY THE FIRST COMMAND OF THIS LAST LOAD]. THE VEHICLE WILL THEN REMAIN IN THE -STORAGE- MODE UNTIL THE POWER CONTROLLER [P.C.] TIMER COUNTS DOWN FROM WHATEVER CYCLE IT IS IN, EITHER 6 MIN. OR 12 MIN. ANY TT+C EQUIPMENT WHICH HAS BEEN ACTIVATED WILL TURN -OFF- WITH THE P.C. ANY SPC-S WHICH WERE SCHEDULED TO EXECUTE IN THIS TIMER SHUT OFF PERIOD WILL NOT OCCUR, [I.E., BE IGNORED AND LOST]. EXTENSION OF THIS CONDITION [SPC LOCKOUT] CAN OCCUR DUE TO A P.C. TIMER RESET FOR EACH OF THESE UNEXECUTED SPC-S WHEN THE TIMER IS IN THE RESETTABLE MODE.

5.2 COMMAND EXECUTION DELAYS

THE MINIMUM TOTAL EXECUTION DELAY FOR ANY COMMAND IS 98 +/- 3.46 MILLISECONDS. THIS DELAY IS COMPRISED OF THE TIME SLOT DELAY AND THE POWER ON ALERT DELAY. THE TIME SLOT DELAY IS DUE TO THE FINITE TIME REQUIRED TO SCAN THE DELAY LINE LOOKING FOR A TIME MATCH WHEN CLOCK TIME CHANGES. THE POWER ON ALERT DELAY ALLOWS THE COMMAND DECODER TO BE ENERGIZED AND INITIALIZED PRIOR TO COMMAND READOUT FROM THE PROGRAMMER.

5.3 MINIMUM TIME TAG SEPARATION

THE COMMAND AND CONTROL COMPUTER PROGRAMS WILL PRODUCE AN ERROR PRINTOUT IF THE TIME SPACING BETWEEN ADJACENT COMMANDS IS LESS THAN 0.5 SECONDS. HOWEVER, THESE TIME SPACINGS MAY BE LESS AND IN THE CASE OF BACKUP SECURE COMMANDS [DIFFERENT SECURE KEY] IT IS RECOMMENDED THAT THE SPACING BE 0.2 SECONDS. THE LIMITATION FOR EACH TYPE OF STORED COMMAND AND THE ACTUAL DECODER TIE UP PERIODS ARE LISTED BELOW.

COMMAND TYPE	MINIMUM SPACING [SEC.]	DECODER TIE-UP [MILLISEC.]
SSPC 1	0.1	37 +/-8.5
SSPC 2	0.1	37 +/-8.5
DSPC 1 [SECURE MATCH]	0.2	157 +/-26
DSPC 1 [NO SECURE MATCH]	0.1	37 +/-8.5
DSPC 2	MUST BE INDIVIDUALLY CALCULATED	
DSPC 3	MUST BE INDIVIDUALLY CALCULATED	
DSPC 4	0.1	49 +/-14
DSPC 5	0.2	150 +/-30

6.4 SIMULTANEOUS DEACTIVATION OF TT+C EQUIPMENT AND THE C.D. IS NOT PERMITTED. TT+C TURNOFF OF EQUIPMENT AT THE END OF A STATION PASS SEQUENCE [SSPC NO. 2] REQUIRES THAT THE C.D. BE TURNED OFF LAST [THE C.D. MUST DECODE THE TT+C OFF BITS PRIOR TO TURNING ITSELF OFF]. NORMALLY, INSTEAD OF USING A COMMAND, THE P.C. TIMER WILL BE USED TO TURN OFF THE C.D. AT THE END OF ITS CYCLE. FUNCTION CP IS TURNED OFF BY THE P.C. TIMER OR THE CD- COMMAND. ALSO, WITH FUNCTION CP+, CH+ WILL AUTOMATICALLY REVERT TO CH-.

6.5 THE LAST WORD LOADED IN ANY DELAY LINE MUST BE THE SECOND WORD OF A DSPC OR THE -DUMMY- COMMAND [NO. 290]. IF AN SSPC IS THE LAST COMMAND WORD IN A LINE IT MUST BE FOLLOWED BY THE -DUMMY- COMMAND IN ORDER TO BE EXECUTED.

6.6 AUTHORIZATION OF COMMAND TRANSMISSION WHEN THE VEHICLE HAS EXITED FROM THE 5 DEGREE CONE SHOULD BE DISCOURAGED. POTENTIAL INCORRECT -ACCEPT- SIGNALS COULD BE OBTAINED [I.E., COMMAND IS NOT REALLY ACCEPTED BUT COMMUNICATION ANOMALIES IN THIS AREA RESULT IN ERRONEOUS SIGNALS AT THE TRACKING STATION].

6.7 IF, WHEN LOADING DIFFICULTIES ARE ENCOUNTERED SUCH THAT TRANSMISSION CEASED AFTER THE 1ST WORD OF DSPC WAS LOADED, NO OTHER WORDS SHOULD BE LOADED INTO THIS LINE OTHER THAN THE DESIRED 2ND WORD OF THE INTERRUPTED DSPC. WHEN TRANSMISSION IS RESUMED THE LINE IN QUESTION SHOULD BE ERASED AND RELOADED. ERRONEOUS COMMAND DECODING WOULD RESULT IF COMMAND LOADING PROCEEDED AFTER SKIPPING THE SECOND WORD OF THE DSPC. WHATEVER WORD WAS LOADED IMMEDIATELY AFTER THE FIRST WORD OF THE DSPC WOULD BE INTERPRETED AS PART OF THE DSPC.

6.8 EXECUTION OF SPC-S DURING STATION PASSES WHERE THE COMMAND LINK IS OPENED [PPD ON - 4 DEGREE CONE] SHOULD BE DISCOURAGED. THE FOLLOWING COMPLICATION COULD ARISE IF A RTC HAS JUST BEEN -ACCEPTED- FROM THE GROUND AND, SIMULTANEOUSLY, AN SPC COMES UP FOR EXECUTION- THE RTC WOULD EXECUTE AND THE SPC WOULD BE IGNORED AND THE DESIRED EVENT WOULD NOT OCCUR. THIS ILLUSTRATES A LOSS OF SPC-S IN THE -REAL TIME- MODE. THE LOSS OF SPC-S IN THE -STORAGE- MODE WAS NOTED IN 6.1.

6.9 REDUNDANCY OF COMMANDS [SAME TIME TAG, SAME COMMAND] IS POSSIBLE BUT MUST BE UTILIZED CAUTIOUSLY. TRUE COMMAND REDUNDANCY REQUIRES USING TWO OR MORE DELAY LINES [DEPENDING ON THE ORDER OF REDUNDANCY DESIRED]. THE LOCATION OF PARTICULAR COMMANDS IN THE DELAY LINES IS CRITICAL. EACH DELAY LINE HAS 99 UNIQUE USEABLE SLOTS [37 BIT WORDS]. ALL LINES ARE SCANNED SIMULTANEOUSLY FOR A TIME TAG MATCH [ALL SLOT NO. 1-S, NO. 2-S, ETC.]. REDUNDANT SSPC-S MAY OCCUR IN THE SAME RELATIVE DELAY LINE SLOTS AND WILL EXECUTE CORRECTLY UNLESS THEY ARE INCORRECTLY STORED, IN WHICH CASE, A LOGICAL -OR- COMBINATION OF -1-S- IS MADE- THIS CONDITION APPEARS REMOTE, AND SSPC REDUNDANCY APPEARS TO OFFER NO PROBLEMS.

6.10 DSPC-S WHEN REDUNDANT, MUST BE HANDLED WITH CARE. AS BEFORE WITH SSPC-S, COINCIDENCE OF REDUNDANT DSPC-S IN THE SAME RELATIVE DELAY LINE SLOTS CAUSES AN -OR- COMBINATION AND SHOULD BE NO PROBLEM. OVERLAP OF REDUNDANT DSPC-S [ONE SLOT DISPLACED] IN THE SAME RELATIVE DELAY LINE SLOTS CAUSES AN -OR- COMBINATION TO BE DECODED AS THE SECOND WORD OF THE DSPC. SERIOUS CONSEQUENCES COULD RESULT. VERLORT -STUTTERING- [SYSTEM MALFUNCTION OF TRANSMITTING SAME WORD[S] MULTIPLE TIMES] COULD DISPUPT AND CAUSE DSPC OVERLAP EVEN FROM A CORRECTLY PREPARED COMMAND LOAD. THIS TYPE OF SYSTEM MALFUNCTION WOULD EVIDENCE ITSELF BY A -DELAY LINE FULL- SIGNAL BEFORE SUCH WOULD BE THE CASE. TO PREVENT THIS CONDITION, A COMMAND LOAD COULD FILL ALL DELAY LINE SLOTS IN THOSE LINES TO BE LOADED [99 WORDS]. -A LINE FULL- INDICATION SHOULD COINCIDE WITH THE LAST WORD TO BE LOADED IN THE SELECTED LINE. A PREMATURE -LINE FULL- WOULD BE -SUSPECT-.

6.11 DURING A COMMAND LOAD STATION PASS, THE FIRST COMMAND TRANSMITTED TO THE VEHICLE MUST NOT BE A HYBRID REAL TIME ENABLE COMMAND [NO. 500], OTHERWISE, A CONTINOUS -REJECT- SIGNAL WILL BE RECEIVED AT THE TRACKING STATION. THIS RESULTS FROM THE CD COMING -ON- ALREADY IN THE REAL TIME MODE [IS CONDITIONED TO RECEIVE ONLY 7-BIT RTC-S].

6.12 WHEN TRYING TO -ERASE- A FULL DELAY LINE [ALL 99 SLOTS FULL], TWO REJECTS WILL GENERALLY BE RECEIVED BEFORE AN ERASE ACCEPT. WHEN ERASING A PARTIALLY FULL DELAY LINE [LESS THAN 99 SLOTS FULL], AN ERASE ACCEPT WILL BE RECEIVED BUT ANY SPC FOLLOWING [COMMANDS TO BE LOADED] WILL GENERALLY BE REJECTED FOR 76 MILLISECONDS. AN ERASE COMMAND [NO. 501] REQUIRES 76 MILLISECONDS TO EXECUTE.

7. LOADING OF SEQUENCES REQUIRING A -SECURE- COMMAND MAY BE HANDLED IN THREE WAYS [OPTIONS OF THE C AND C COMPUTER PROGRAM].

7.1 ALL COMMANDS EXCEPT THE -SECURE- COMMAND MAY BE LOADED INTO THE VEHICLE. AT A PRE-DETERMINED STATION PASS [PROVIDED THE VEHICLE IS GO] THE -SECURE- COMMAND WILL BE LOADED INTO THE SAME DELAY LINE WITH THE PREVIOUSLY LOADED COMMANDS IN THIS SEQUENCE. THIS IS CONSISTENT WITH THE RECOMMENDED PROCEDURE OF NOT SPLITTING COMMANDS IN A GIVEN SEQUENCE BETWEEN TWO OR MORE DELAY LINES.

7.2 THE COMPLETE -SECURE- SEQUENCE WILL BE LOADED INTO THE VEHICLE AND ALL COMMAND LINK OPENINGS [PPD ON] WILL BE DELETED UNTIL -SECURE- EVENT HAS OCCURRED.

7.3 THE COMPLETE -SECURE- SEQUENCE WILL BE LOADED INTO THE VEHICLE AND NO COMMAND LINK OPENING WILL BE SUPPRESSED.

7.4 EACH PPD ON COMMAND INCREMENTS THE SECURE KEY BY ONE. THIS IS TRUE WHETHER OR NOT THE PPD IS ALREADY ACTIVATED. EVERY SECURE TURN ON OF THE PPD THRU BUSS INCREMENTS THE SECURE COUNT BY ONE.

7.5 THE SECURE KEY INDEX RANGE IS FROM 0 TO 127. WHEN THE SECURE KEY COUNT IN THE VEHICLE REACHES 127 NO RECYCLING WILL OCCUR. ALL -SECURE- KEYS FROM THIS POINT ON WILL BE NUMBER 127.

3. GENERAL HARDWARE OPERATION CONSIDERATIONS-

3.1 LAUNCH AND ASCENT

3.1.1 IT IS RECOMMENDED THAT THE OCV/AGENA SEPARATION COMMAND BE LOADED REDUNDANTLY IN THE PAD LOAD IN AT LEAST ONE OTHER DELAY LINE. THIS IS TO REDUCE THE POSSIBILTY OF NOT ATTAINING MISSION SUCCESS, THROUGH THE FAILURE OF THE DELAY LINE CONTAINING THE OCV/AGENA SEPARATE COMMAND DURING POWERED FLIGHT. IF THIS ADDITIONAL SEPARATION COMMAND IS TIME BUMPED 0.3 SECONDS FROM THE ORIGINAL COMMAND REPETITIVE TRIGGERING OF THE SCR PYRO SEPARATION CIRCUIT WILL OCCUR, WHICH SEEMS DESIRABLE. IF A REDUNDANT SEPARATION COMMAND AT THE SAME TIME TAG AS THE ORIGINAL COMMAND IS UTILIZED, THE ABOVE ADDITIONAL BACKUP TRIGGERING FEATURE WILL NOT BE PRESENT BUT THE MAJOR FAILURE MODE OF AN INOPERATIVE DELAY LINE WILL BE GUARDED AGAINST.

3.1.2 TO AVOID CONFLICTS WITH AGENA VENTING FOLLOWING AGENA ENGINE CUTOFF, THE OCV/AGENA SEPARATION COMMAND IN THE PAD LOAD SHOULD BE SPACED 700 SECONDS AFTER LIFT-OFF.

COMMAND NO.375 [CPR] SHOULD BE SPACED 680 SECONDS AFTER LIFT-OFF.

3.1.3 THE RPU COMMAND -MUST- BE FOLLOWED BY AN F+ OR F- WITHIN 600 SEC.

3.2 ORBIT ADJUST

3.2.1 THE OCV ENGINES SHOULD NOT BE IGNITED ANY SOONER THAN 30 SECONDS FOLLOWING PRESSURIZATION OF THE OCV TANKS [ENGINE BLEED SEQ].

3.2.2 THE ENGINES ON COMMAND [E1+ AND/OR E2+] -MUST- BE FOLLOWED BY AN ENGINES OFF [E-] WITHIN 600 SECONDS.

3.3 TLM CONSIDERATIONS

3.3.1 RECORDER PLAYBACK SHOULD OCCUR AT THE FIRST STATION CONTACT FOLLOWING ANY RECORDED OPERATIONS.

3.3.2 IT IS POSSIBLE TO RECORD THE IR PREAMPLIFIER OUTPUTS. THE LEFT HAND PREAMP IS RECORDED CONTINUOUSLY WHENEVER THE RECORDER IS IN MODE 1 AND TELEMETRY IS OFF. THE RIGHT HAND PREAMP IS RECORDED WHEN R1+ AND I+ ARE COMMANDED WITH T-, AND TOTAL CURRENT IS RECORDED WHEN R1+ AND I- ARE COMMANDED WITH T-. WITH TM ON [FROM T+ OR VIA BUSS COMMAND LINK] THE PROGRAMMER WORD LINE COUNT IS MONITORED IN PLACE OF THE RIGHT HAND PREAMP AND TOTAL CURRENT.

3.3.3 TO SIMPLIFY THE ANNOTATION OF FLIGHT RECORDER PLAYBACK DATA, BOTH FOR POST-FLIGHT ANALYSIS AND ON-ORBIT REDUCTION, A RECYCLING 0 TO 7 BINARY COUNTER HAS BEEN IMPLIMENTED TO INDEX THE RECORDED SEGMENT ON TELEMETRY. THE COUNTER IS INCREMENTED BY RECORDER 1 MODE ON.

8.3.4 IN ORDER TO MONITOR THE ERECTION OF THE BUSS MAGNETOMETER BOOM THE PRIMARY SYSTEM TM SHOULD BE ON AND THE RECORDER ON IN MODE 1 PRIOR TO THE OVS EVENT [OCV/AGENA SEPARATION COMMAND]. THE BOOM WILL BE ERECTED NO SOONER THAN 15 SECONDS AFTER THE OVS COMMAND, AND CAN BE VERIFIED BY CERTAIN SWITCH CLOSURE SIGNALS AND CHANGES IN MAGNETOMETER READINGS ON TELEMETRY.

8.3.5 ACTIVATION OF RECORDER MODE 2 PREVENTS TRANSMISSION OF BUSS TM ALTHOUGH BUSS COMPONENTS REMAIN ACTIVATED. TURN ON OF BUSS IN TEST MODE [UNSECURE TONE COMMAND] TERMINATES RECORDER MODE 2. IF HOWEVER, RECORDER MODE 2 IS CALLED FOR AFTER T+, THEN BUSS TM WILL BE LOST AND RECORDER MODE 2 COMES IN. R2+ IS INHIBITED FOR 20 MINUTES FROM T3, T6 OR T9 DEPENDING ON THE MODE [SEE SECTION 9.5].

8.3.6 THE BASE PLATE TEMPERATURE OF THE TM XMTR-S SHOULD NOT EXCEED 140 DEGREES F DURING ANY PORTION OF THE MISSION. THE XMTR-S SHOULD BE TURNED OFF UNTIL THIS TEMPERATURE RETURNS TO A NOMINAL READING.

8.4 MISCELLANEOUS

8.4.1 THE VEHICLE CLOCK [23 BITS] WILL RECYCLE TO ZERO WHEN IT HAS COUNTED THRU ITS RANGE [APPROXIMATELY 9.7 DAYS].

8.4.2 IN CONJUNCTION WITH [6.3] AND [7.2] ABOVE, COMMAND NOS. 485 AND 495 -OVERRIDE- WERE DEFINED TO PREVENT THE EXECUTION OF AN UNDESIRED COMMAND PREVIOUSLY LOADED IN THE VEHICLE. THESE COMMANDS CREATE A C.D. BUSY CONDITION FOR APPROXIMATELY 0.5 SECONDS. WHEN LOADED WITH A TIME TAG 0.2 SECONDS PRIOR TO EXECUTION OF THE UNDESIRED COMMAND, THIS UNWANTED EVENT WILL NOT OCCUR. IN THE EVENT OF A 10 PPS ANOMALY, A DSPC 5, WHICH CAUSES A .15 SECOND BUSY SIGNAL, SHOULD BE PLACED 0.1 SECONDS PRIOR TO THE UNDESIRED COMMAND TO PERFORM THIS FUNCTION.

8.4.3 THE COMPUTER TIMER BYPASS [CT] FUNCTION WILL BE COMMANDED TO THE ONE STATE ONLY IN THE EVENT OF [A] A PRIMARY COMPUTER FAILURE, OR [B] AN EXPERIMENT TO TEST THE OPERABILITY OF THE BACK-UP SYSTEM AFTER RV DEBOOST.

CAUTION- ONCE CT HAS BEEN COMMANDED IT WILL RESULT IN ACTIVATION OF THE BACK-UP SYSTEM. THIS IS A UNILATERAL PROCESS [NO COMMAND RESET CAPABILITY].

8.4.4 THE -SEARCH MODE- FUNCTION SHOULD BE COMMANDED ON WITH RTC 15 WHENEVER EITHER IR SCANNER LOSES EARTH LOCK. WHEN LOCK IS RE-AQUIRED, SEARCH MODE OFF [DSPC 5-2-8] SHOULD BE COMMANDED.

3.4.5 THE FOLLOWING TIMING CONSIDERATIONS ARE APPLICABLE TO P.B. COMMANDING.

3.4.5.1 PS INHIBITS PR EXECUTION AND VICE-VERCA UNTIL PO IS PROPERLY EXECUTED.

3.4.5.2 PO OR 1C7B AFTER PS OR 1C7A FROM 0 TO 8.8 INCLUSIVE WILL TERMINATE P.B. AFTER THE PRESENT 9.6 SEQUENCE. PO OR 1C7B AFTER PS OR 1C7A FROM 8.9 TO 9.6 INCLUSIVE WILL TERMINATE P.B. AFTER ONE ADDITIONAL 9.6 SEQUENCE.

3.4.5.3 PS AFTER PO AT ANY .1 SECOND INTERVAL FROM 0 TO 8.8 INCLUSIVE, FROM 9.0 TO 9.6 INCLUSIVE, OR DURING THE 2.4 SECOND TRANSITION TIME WILL RESET THE PO LOGIC AND PS WILL CONTINUE NORMALLY. PS AFTER PO AT 8.9 WILL NOT RESET THE PO LOGIC, AND PS TERMINATES AFTER THE PRESENT 9.6 SEQUENCE.

3.4.5.4 PR AFTER PO WILL NOT AFFECT TERMINATION OF PR.

3.4.6 IN DSPC-2 AND DSPC-3 COMMANDS, BITS 32 AND 33 OF THE SECOND WORD DEFINE GFE 1-C8 AND 1-C9. THE ONLY LEGITIMATE CONFIGURATIONS FOR THESE TWO BITS ARE 00, 01, AND 11. THE CONFIGURATION 10 SHOULD NEVER BE ASSEMBLED.

3.4.7 THE TC+ FUNCTION [GFE 1-C15] MUST BE EXECUTED PRIOR TO THE GFE 1-C17 [FA] OR GFE 1-C18 [RA] FUNCTIONS, [I.E., TC+ IS AN ENABLE FUNCTION].

3.5 DEBOOST

3.5.1 CP+ MUST NOT BE COMMANDED BETWEEN DS1 AND SEP. CH+ SHOULD BE COMMANDED BEFORE DS1 AND A CH- COMMANDED AFTERWARDS.

3.5.2 OCV MUST BE IN A FLY REVERSE ATTITUDE TO BE DEBOOSTED.

9. BUSS - BACK-UP STABILIZATION SUBSYSTEM

9.1 BUSS IS DESIGNED FOR ACTIVATION OVER KODI [REAL TIME] OR POGO [NEXT STATION] ON A NORTH TO SOUTH PASS OR COOK NEXT ORBIT. THE BUSS COMMANDS, 4 UNSECURE AND 2 SECURE, ARE COMBINATIONS OF AUDIO TONES. ALL STATIONS ARE CAPABLE OF TRANSMITTING THESE COMMANDS.

9.2 THE UNSECURE COMMANDS AND FUNCTIONS ARE -

ZEKE 26 - E TONE FOLLOWED BY G TONE - ENABLES THE SELECTIVE ADDRESS J-BOX FOR 3.8 SECONDS TO ACCEPT THE UNSECURE ZEKE 21/22/23/24 COMMAND.

ZEKE 21 - G TONE FOLLOWED BY E TONE - ARMS BUSS NEXT STATION.
ZEKE 22 - G TONE FOLLOWED BY F TONE - ARMS BUSS NEXT ORBIT.
ZEKE 23 - F TONE FOLLOWED BY G TONE - ARMS BUSS REAL TIME.
ZEKE 24 - F TONE FOLLOWED BY E TONE - ARMS BUSS REAL TIME NO GAS.
ZEKE 25 - E TONE FOLLOWED BY F TONE - BUSS MODE DETERMINATION.

9.3 THE SECURE COMMANDS AND FUNCTIONS ARE -

KIK ZEKE 31 - BUSS EXECUTE AND INITIATE B TIMER.
KIK ZEKE 32 - TURN ON PRIMARY COMMAND [PPD, CD, POA]

EACH OF THESE COMMANDS CONSISTS OF AN A TONE, ENABLING POWER TO THE TYPE IX DECODER, FOLLOWED BY A D TONE, RESETTING THE STORAGE REGISTER, FOLLOWED BY A 36 BIT SECURE WORD CONSTRUCTED OF B TONES [LOGICAL 1] AND C TONES [LOGICAL 0] INTERSPERSED WITH A TONES.

9.4 BUSS OPERATES IN THE FOLLOWING MANNER, THE ZEKE 26 COMMAND FOLLOWED WITHIN 3.8 SECONDS BY A ZEKE 21/22/23/24 COMMAND CONSTITUTES AN UNSECURE MODE SELECT. A SECURE KIK ZEKE 31 PRECEEDED BY AN UNSECURE PAIR EXECUTES BUSS IN THE MODE DEFINED BY ZEKE 21/22/23/24. ZEKE 21/22/23 FOLLOWED BY KIK ZEKE 31 EXECUTION ENABLES THE BUSS GAS SYSTEM AND DISABLES BOTH THE ZEKE COMMAND AND THE PRIMARY COLD GAS SYSTEM AT A PREDETERMINED TIME. ZEKE 24 PROVIDES COMMANDS FOR SEPARATION BUT DOES NOT ENABLE BUSS GAS SYSTEM OR DISABLE PRIMARY GAS SYSTEM.

9.4.1 BUSS MODE DETERMINATION [MODE 6] IS OBTAINED AS FOLLOWS-
A ZEKE 25 COMMAND WHEN PRECEDED BY A PROPERLY SPACED ZEKE 26 ADDRESS COMMAND, AFTER THE EXECUTION OF A ZEKE 21, 22, 23 OR 24 UNSECURE COMMAND PRECEDED BY A PROPERLY SPACED ZEKE 26 ADDRESS COMMAND WILL- ENERGIZE THE R/V TELEMETRY FOR 20+/-0.5 MINUTES. THIS TIME IS MEASURED FROM THE TIME OF THE EXECUTION OF THE LAST ZEKE 26-21, 26-22, 26-23 OR 26-24 UNSECURE COMMAND.
A ZEKE 25 COMMAND EVEN THOUGH PRECEDED BY A PROPERLY SPACED ZEKE 26 COMMAND, WILL HAVE NO EFFECT WHEN THE BUSS SUBSYSTEM IS IN THE RESET MODE OR WHEN THE 20 MINUTE TIMER [A TIMER] HAS TIMED OUT. A TM- COMMAND WILL TURN OFF BUSS MODE 6.

KIK ZEKE 32 PRECEEDED OR FOLLOWED BY AN UNSECURE PAIR TURNS ON THE PRIMARY COMMAND SYSTEM AND THE SV TELEMETRY IN THE BUSS MODE. IF BUSS IS USED FOR DEBOOST [KIK ZEKE 31] THE FOLLOWING SEQUENCE OF EVENTS OCCURS IN EACH MODE.

9.5 BUSS TIMER EVENTS

EVENT	MODE 1 OR 4 BRT[Z26/23]	MODE 2 BNS[Z26/21]	MODE 3 BNO[Z26/22]	MODE 5 BRTNG[Z26/24]	TIME [SEC]	TIME BETWEEN EVENTS [SEC]
T0	PRIM GAS OFF,	*	*	N/A	0.0	
	GFE POWER ON	*	*	*		2.0
	INIT. B TIMER	*	*	*		
T1	DS1	*	*	*	2.0	
						2.0
T2	DS2 **	*	*	*	4.0	
	GFE POWER OFF	*	*	*		2.0
T3	INIT. A TIMER	N/A	N/A	*	6.0	
	INITIATE TM ***	N/A	N/A	*		
	BUSS GAS ON	N/A	N/A	N/A		99.5
	ARM	N/A	N/A	*		
T4	TRANSFER	N/A	N/A	*	105.5	
						2.5
T5	SEPARATE	N/A	N/A	*	108.0	
						383.0
T6	N/A	INIT. A TIMER	N/A	N/A	491.0	
		INITIATE TM ***				
		BUSS GAS ON				99.5
		ARM				
T7	N/A	TRANSFER	N/A	N/A	590.5	
						2.5
T8	N/A	SEPARATE	N/A	N/A	593.0	
						4505.0
T9	N/A	N/A	INIT. A TIMER	N/A	5098.0	
			INITIATE TM ***			
			BUSS GAS ON			99.5
			ARM			
T10	N/A	N/A	TRANSFER	N/A	5197.5	
						2.5
T11	N/A	N/A	SEPARATE	N/A	5200.0	
						600.0
T12	ENABLE BUSS CMD	*	*	*	5800.0	

MODE 4 BREX [ABE+/BUX] EVENTS T0 THROUGH T12 ARE THE SAME AS MODE 1 BRT.

* SAME AS MODE 1 BRT.

** DISCONNECT 3 IS IMPLICIT IN DS2 COMMAND

*** FROM T3, T6 OR T9 [DEPENDING ON MODE] ON P.C. TIMER RUN OUT AND R2+ ARE INHIBITED FOR 20 MINUTES. AT THE END OF THIS TIME P.C. TIMER STARTS AND R2+ CAN BE COMMANDED.

9.6 ZEKE 21/22/23/24 SECONDARY EFFECTS

9.6.1 ZEKE 21/22/23/24 TURNS ON REAL TIME TELEMETRY, VERLORT, AND BUSS TM, TURNS RECORDER PLAYBACK OFF, AND ENERGIZES BUSS ELECTRONICS. ALL OF THE ABOVE EXCEPT BUSS ELECTRONICS WILL BE TURNED OFF BY THE CD [CD OFF OR P.C. TIMER RUN OUT]. BUSS ELECTRONICS ARE TURNED OFF BY THE BUSS 1200 SECOND TIMER WHEN KIK ZEKE 31 IS NOT SENT. TM IS TURNED OFF 20 MINUTES PLUS P.C. TIMER RUN OUT AFTER T3, T6 OR T9 DEPENDING ON THE MODE. T12 TURNS OFF BUSS ELECTRONICS AND GAS VALVE AND ENABLES BUSS COMMAND SYSTEM.

9.6.2 RECORDER MODE 1 IS UNAFFECTED BY ZEKE 21/22/23/24. IF ZEKE 21/22/23/24 IS ACTIVATED BY COMMAND OR INTERFERENCE WHILE RECORDING, THE RECORDED DATA WILL BE SLIGHTLY DEGRADED DUE TO LOSS OF TAPE SPEED COMPENSATION. IF RECORDER PLAYBACK IS TURNED ON AFTER ZEKE 21/22/23/24, THE BUSS TELEMETRY IS NOT TRANSMITTED ALTHOUGH BUSS EQUIPMENT REMAINS ON.

9.6.3 THE P.C. TIMER IS RESET BY ZEKE 21/22/23/24, A CD OFF COMMAND [SSPC-2] TURNS OFF BUSS TELEMETRY, AND T+ WHEN COMMANDED BY THE PRIMARY SYSTEM ACTIVATES ALL BUSS ELECTRONICS EXCEPT THE BUSS RATE GYRO.

9.7 THE BUSS GAS SYSTEM WILL ORIENT THE VEHICLE IN 90 SECONDS OR LESS AT A RATE OF 17 DEGREES/SEC OR LESS. THE MINIMUM TOTAL CAPABILITY OF THE SYSTEM, INCLUDING ORIENTATION TIME, IS 102.0 SECONDS.

9.8 ASSOCIATED WITH BUSS IS THE USE OF RTC NO. 6 - VOLTAGE DROPPING BYPASS. THIS RTC IS TO BE UTILIZED WHEN THE VEHICLE HAS BEEN OBSERVED AT 26 VOLTS FOR 3 OR 4 PASSES [BATTERY -PLATEAU- REGION]. THIS OBSERVATION OF VOLTAGE DURING PERIODS OF HIGHER DRAIN IS TO ASSURE THAT THE READING IS VALID AND THAT THE VOLTAGE IS ACTUALLY LOW ENOUGH TO SAFELY BYPASS THE STEP DOWN MODULE. SINCE THE CURRENT DRAIN IS HIGHER DURING A STATION PASS THE BATTERY VOLTAGE WILL BE PULLED DOWN DURING THIS PERIOD AND WILL RISE AGAIN AFTER TT+C IS TURNED OFF. SINCE BUSS WILL WORK AT 22 VOLTS AND SINCE THERE IS A 4 VOLT DROP ACROSS THE ZENERS, THERE IS NO DANGER IN WAITING FOR THE VOLTAGE TO DECAY TO THIS POINT.

9.9 BUSS ENABLE [ABE+] COMMAND MUST BE GIVEN BEFORE BUSS EXECUTE [BUX] COMMAND IF BUX IS TO BE EXECUTED.

10. ALTITUDE LIMITATIONS ON THE PRIMARY STABILIZATION SUBSYSTEM -------

10.1 ALL -TABOO- CONDITIONS LISTED PREVIOUSLY STILL APPLY.

10.2 BELOW 80NM-

DURING YAW OR PITCH MANEUVERS THE YAW AND PITCH AXES MUST BE IN HIGH THRUST. FINE DEADBANDS SHOULD BE USED.

10.3 BELOW 70NM-
A. 65NM IS THE LOWEST LIMIT.
B. NO YAW, PITCH, OR ROLL MANEUVERS SHOULD BE PERFORMED BELOW 70NM.
C. THE YAW, PITCH, AND ROLL MUST BE IN HIGH THRUST.

11. COMMAND AND CONTROL COMPUTER PROGRAM REQUIREMENTS--

11.1 THE -ALTER- MODE OF OPERATION SHOULD FOLLOW ONLY -MIXED- OR -NORMAL- MODE ASSEMBLY. IF USED AFTER -TC ONLY- MODE, THE ORIGINAL DELAY LINE ASSIGNMENT WILL NOT BE PRESERVED.

11.2 THE -HAND SPEC- ALTER MODE CAN ONLY BE EFFECTIVELY UTILIZED WHEN THE COMMAND -TIME PERIOD- [T1 TO T2] TO BE ALTERED IS CONTAINED COMPLETELY WITHIN THE PRESENT ACL [ASSEMBLED COMMAND LIST] I.E., NO PREVIOUSLY LOADED COMMANDS [IN DELAY LINES NOT TO BE ERASED FOR THIS LOAD] AFFECT THE VEHICLE FUNCTIONS TO BE ALTERED DURING THE TIME PERIOD.

11.3 IF SUCH IS NOT THE CASE [FUNCTIONS ARE AFFECTED] TWO CHOICES REMAIN [1] SPECIFY ANOTHER -SAFE- TIME PERIOD [T1 TO T2], OR [2], RELOAD THE DELAY LINES WHICH PREVENT THE DESIRED TIME PERIOD ALTERATION. A CHRONOLOGICAL STUDY OF THE DVCT [MERGER OF NEW MESSAGE AND CVCT] WOULD REVEAL TIME PERIOD INCONSISTENCIES PRIOR TO CALLING THE -HAND SPEC- MODE.

11.4 IF MESSAGE TRANSMISSION IS NOT COMPLETED AND THE VEHICLE NOT RETURNED TO THE REAL TIME MODE, EXAMINE THE GCOMMAND OUTPUT FOR POSSIBLE IGNORED COMMANDS [SPC LOCKOUT CONDITION]. UPDATE TELIM AS A RESULT OF THIS TC ANALYSIS.